

VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the **issuance** of the VPDES permit listed below. This permit is being processed as a **major, municipal** permit. The permit includes effluent limitations and requirements for design flow tiers of 0.5 MGD, 1.0 MGD, and 1.5 MGD. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 et.seq. The proposed initial wastewater treatment facility is a 0.5 MGD activated sludge wastewater treatment system consisting of an influent screen and grit facility, oxidation ditch, dual secondary clarifiers, ultraviolet disinfection facilities, Parshall flume and flow meter, cascade aerator, aerobic digester, sludge de-watering facilities..

This permit action consists of limiting pH, BOD<sub>5</sub>, suspended solids, ammonia nitrogen, E.coli and dissolved oxygen; including special conditions regarding compliance reporting, control of significant dischargers, whole effluent toxicity testing, and other requirements and special conditions.

SIC Code: 4952

1. Facility Name and Address:

**Western Washington County Water Reclamation Facility**  
Off Bordwine Road  
Bristol, VA 24202

2. Permit No. VA0092860

3. Owner Name and Address:

Washington County Service Authority  
25122 Regal Drive  
Abingdon, VA 24211

Owner Contact:

Robert C.H. Cornett  
Title: General Manager  
Telephone No: 276-628-7151

4. Application Complete Date: May 18, 2015

Permit Drafted By: Fred M. Wyatt, SWRQ Fred M. W Date: May 25, 2015  
Reviewed By: Steve E. Antif Date: 6/26/2015  
Public Comment Period Dates: from \_\_\_\_\_ to \_\_\_\_\_

5. Receiving Stream Name: Beaver Creek; River Mile: 6CBEV023.81 Basin: Tennessee-Big Sandy River; Subbasin: Holston River; Section: 4; Class: V; Special Standards: None. Lat.: 36°39'25"; Long.: 82°06'15"

1-Day, 10-Year Low Flow (1Q10): 1.70 MGD (June - Nov.)  
1Q10 High Flow: 1.77 MGD (Dec. - May)  
7-Day, 10-Year Low Flow (7Q10): 1.77 MGD (June - Nov.)  
7Q10 High Flow: 1.77 MGD (Dec. - May)  
30-Day, 10-Year Low Flow (30Q10): 2.00 MGD (June - Nov.)  
30Q10 High Flow: 2.18 MGD (Dec. - May)  
Harmonic Mean Flow (HM): 5.0 MGD

Tidal? No

303(D) list? Yes (See Item # 13 below)

6. Operator License Requirements:

0.5 MGD WWTP: Class III; 1.0 MGD WWTP and 1.5 MGD WWTP: Class II

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7. Reliability Class: I
8. Permit Characterization:  
( ) Private ( ) Federal ( ) State (X) POTW ( ) PVOTW  
( ) Possible Interstate Effect ( ) Interim Limits in Other Document
9. Attach a schematic of and provide a brief description of the wastewater treatment system.

Discharge Description

| OUTFALL NUMBER | DISCHARGE SOURCE (1)      | TREATMENT (2)                     | DESIGN FLOW (3)   |
|----------------|---------------------------|-----------------------------------|---|
| 001            | Western Washington County | See Page 1 above, first paragraph | 0.5 MGD -Phase I;<br>1.0 MGD - Phase II;<br>1.5 MGD - Phase III |

10. Sewage Sludge

*Sewage Sludge Treatment Process:* Aerobic digestion, de-watering, and transporting to BFI Carter Valley Landfill in Church Hill, TN.

11. Discharge Location Description: See attached Wyndale-VA Quadrangle; Number: 026A
12. Material Storage: None reported
13. Ambient Water Quality Information: The 2014 Impaired Water Fact Sheets (attached) list mainstream Beaver Creek as impaired from the Beaver Creek flood control dam downstream to the Tennessee state line, including it's tributaries. The stream is also impaired from the headwaters of Beaver Creek near Ratliff Knob downstream to the Beaver Creek flood control dam. The stream is impaired for recreation use (bacteria), aquatic life use (benthics) due to sediments, and fish consumption (PCBs).

The report attributes the causes of the bacterial impairment to E.coli and fecal coliform and attributes the sources to rural (residential areas), unrestricted cattle access, and wastes from pets.

This segment is not supporting the aquatic life use goal. The impairment is listed as benthic-macroinvertebrate bio-assessments and the cause is sedimentation/ siltation. The sources are listed as crop production (crop land or dry land, rural (residential areas), unrestricted cattle access, and urban runoff/storm sewers.

The segment is not supporting the use goal of fish consumption. The cause is PCBs in fish tissue. The sources are inappropriate waste disposal.

The existing TMDL for Beaver Creek for bacteria and sediment has been remodeled and is being revised concurrently with the issuance of this permit to include the wasteload allocations (WLAs) for this proposed discharge and other WLAs. The bacterial and sediment TMDL for this permit was originally approved by EPA on July 6, 2004.

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14. Antidegradation Review & Comments: Tier I (X) Tier II Tier III  
The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier I or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier II water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier II waters is not allowed without an evaluation of the economic and social impacts. Tier III water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters. The antidegradation review begins with a Tier determination. Since the receiving stream is listed on the 303(D) Report as impaired for recreation use (bacteria), aquatic life use (benthics) due to sediments, and fish consumption (PCBs), it is considered a Tier I stream.

15. Site Inspection: 06/08/2015

16. Effluent Screening & Limitation Development:

Water Quality Based Limits

a. pH:

A pH range of 6.0 - 9.0 standard units is assigned to Class V waters per the Virginia Water Quality Standards.

b. Biochemical Oxygen Demand  $BOD_5$  and Dissolved Oxygen:

The staff used the steady state Streeter Phelps Regional Modeling System (V 4.0) to project acceptable dissolved oxygen and biochemical oxygen demand. The 7Q10 flow frequency was used in these calculations. The discharge was modeled with the initial design flow of 0.5 MGD and the future design flows of 1.0 MGD and 1.5 MGD. TKN values used in the model were calculated by adding a 3 mg/l refractory nitrogen value to the ammonia nitrogen toxicity values which were calculated based on the Virginia Water Quality Standards. The model indicated that secondary treatment level  $BOD_5$  effluent limitations (30 mg/l monthly average) were adequate to protect aquatic life. However, this facility will discharge into Beaver Creek just upstream of Sugar Hollow Park, a primary recreation area. This stream flows through picnic areas, which have the potential for direct contact such as from aerosols and stream wading. Using Best Professional Judgment and guidance provided in the Water Reclamation and Reuse Regulation 9VAC25-70-10 et seq. for Level 1 (human contact) usages, monthly average effluent limitations of 10/10 mg/l and weekly average effluent limitations of 15/15 mg/l for  $BOD_5$  and total suspended solids are being required. The discharge was re-modeled for a monthly average CBOD<sub>5</sub> of 8 mg/l, equivalent to a  $BOD_5$  of 10 mg/l to determine effluent dissolved oxygen requirements. Acceptable effluent dissolved oxygen values of 1.0 mg/l for 0.5 MGD flow, 3.0 mg/l for 1.0 MGD flow and 4.0 mg/l

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for 1.5 MGD flow, were determined. However, a conservative 4.0 mg/l dissolved oxygen value will be used for all flow tiers.

c. *Total Suspended Solids:*

Total Suspended Solids concentrations are 10 mg/l monthly average and 15 mg/l weekly average as explained in b. above.

d. *Ammonia Nitrogen:*

Effective on August 27, 2003 the State Water Control Board adopted new criteria for ammonia nitrogen (9VAC25-260-155).

An acute ammonia nitrogen standard is now calculated without consideration of the stream temperature. The 90<sup>th</sup> percentile pH from Storet data at milemarker 6CBEV022.29 was used with the ammonia tables in the Water Quality Standards to determine the acute ammonia criteria value. The acute criteria are more restrictive if the trout species are present (only Class V or VI waters). The 1Q10 flow frequency value and high flow 1Q10 frequency value were used to calculate the steady state waste load allocations for both the low stream flow season and the high stream high flow season respectively.

A chronic ammonia nitrogen standard is now calculated by considering whether or not the early life stage of fish are present or absent. The 30Q10 flow frequency value and the high flow 30Q10 frequency value are used to calculate the steady state waste load allocations for both the low stream flow season and the high stream high flow season respectively.

The 90<sup>th</sup> percentile pH from Storet data at milemarker 6CBEV022.29 and dry and wet season temperatures, based on Storet data and best professional judgment, were used to determine the chronic criteria value from the Water Quality Standards.

Effluent ammonia values were also determined using EPA's new 2013 aquatic life ambient water quality criteria for ammonia. A special condition is being included in the permit requiring the permittee to design treatment facilities to meet these calculated effluent values. These calculated values cannot be enforced as effluent limitations, since the State Water Control Board has not yet adopted the EPA criteria as Virginia Water Quality Standards.

c. *E.coli Bacterial Standards:*

This facility will discharge into Beaver Creek, just upstream of Sugar Hollow Park, a primary recreation area. This stream flows through picnic areas, which have the potential for direct human contact, such as from aerosols and stream wading. Using Best Professional Judgment and guidance provided in the Water Reclamation and Reuse Regulation 9VAC25-70-10 et seq. for Level 1 (human contact) usages, an E. coli limit of 11 colonies/100 ml (for Level

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1) is being required. Samples are required to be collected between 10:00 a.m. and 4:00 p.m., and results must be calculated as a geometric mean. Samples are required to be collected, 3 or 5 days per week, depending on design flow.

## Basis for Effluent Limitations: 0.5 MGD WWTP

| PARAMETER                         | BASIS FOR LIMITS * | DISCHARGE LIMITS                |                    |         |         | MONITORING REQUIREMENTS                 |                                   |
|-----------------------------------|--------------------|---------------------------------|--------------------|---------|---------|---|-----------------------------------|
|                                   |                    | MONTHLY AVERAGE                 | WEEKLY AVERAGE     | MINIMUM | MAXIMUM | FREQUENCY                               | SAMPLE TYPE                       |
| Flow                              | NA                 | NL                              | NA                 | NA      | NL      | Continuous                              | Totalizing Indicating & Recording |
| PH                                | 2                  | NA                              | NA                 | 6.0 SU  | 9.0 SU  | 1/Day                                   | Grab                              |
| BOD <sub>5</sub>                  | 1,4,5              | 10 mg/l<br>19 kg/d              | 15 mg/l<br>28 kg/d | NA      | NA      | 3 Days/Wk.                              | 8 Hour Composite                  |
| Total Suspended Solids            | 1,4                | 10 mg/l<br>19 kg/d              | 15 mg/l<br>28 kg/d | NA      | NA      | 3 Days/Wk.                              | 8 Hour Composite                  |
| Ammonia Nitrogen (June 1-Nov. 30) | 2,5                | 3.8 mg/l                        | 5.2 mg/l           | NA      | NA      | 3 Days/Wk.                              | 8 Hour Composite                  |
| Ammonia Nitrogen (Dec. 1-May 31 ) | 2,5                | 4.8 mg/l                        | 6.5 mg/l           | NA      | NA      | 3 Days/Wk.                              | 8 Hour Composite                  |
| Dissolved Oxygen                  | 2,5                | NA                              | NA                 | 4.0     | NA      | 1/Day                                   | Grab                              |
| E.coli, n/100 ml                  | 2,4                | 11 n/100 ml<br>(Geometric Mean) | NA                 | NA      | NA      | 3 Days/Wk. between 10:00 am and 4:00 pm | Grab                              |

## Basis for Effluent Limitations: 1.0 MGD WWTP

| PARAMETER                         | BASIS FOR LIMITS * | DISCHARGE LIMITS   |                    |         |         | MONITORING REQUIREMENTS |                                   |
|-----------------------------------|--------------------|--------------------|--------------------|---------|---------|-------------------------|-----------------------------------|
|                                   |                    | MONTHLY AVERAGE    | WEEKLY AVERAGE     | MINIMUM | MAXIMUM | FREQUENCY               | SAMPLE TYPE                       |
| Flow                              | NA                 | NL                 | NA                 | NA      | NL      | Continuous              | Totalizing Indicating & Recording |
| PH                                | 2                  | NA                 | NA                 | 6.0 SU  | 9.0 SU  | 1/Day                   | Grab                              |
| BOD <sub>5</sub>                  | 1,4,5              | 10 mg/l<br>38 kg/d | 15 mg/l<br>57 kg/d | NA      | NA      | 5 Days/Wk.              | 24 Hour Composite                 |
| Total Suspended Solids            | 1,4                | 10 mg/l<br>38 kg/d | 15 mg/l<br>57 kg/d | NA      | NA      | 5 Days/Wk.              | 24 Hour Composite                 |
| Ammonia Nitrogen (June 1-Nov. 30) | 2,5                | 2.2 mg/l           | 2.8 mg/l           | NA      | NA      | 5 Days/Wk.              | 24 Hour Composite                 |

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## Basis for Effluent Limitations: 1.0 MGD WWTP

| PARAMETER                        | BASIS FOR LIMITS * | DISCHARGE LIMITS                |                |         |         | MONITORING REQUIREMENTS                 |                   |
|----------------------------------|--------------------|---------------------------------|----------------|---------|---------|---|-------------------|
|                                  |                    | MONTHLY AVERAGE                 | WEEKLY AVERAGE | MINIMUM | MAXIMUM | FREQUENCY                               | SAMPLE TYPE       |
| Ammonia Nitrogen (Dec. 1-May 31) | 2,5                | 2.8 mg/l                        | 3.5 mg/l       | NA      | NA      | 5 Days/Wk.                              | 24 Hour Composite |
| Dissolved Oxygen                 | 2,5                | NA                              | NA             | 4.0     | NA      | 1/Day                                   | Grab              |
| E.coli, n/100 ml                 | 2,4                | 11 n/100 ml<br>(Geometric Mean) | NA             | NA      | NA      | 5 Days/Wk. between 10:00 am and 4:00 pm | Grab              |

## Basis for Effluent Limitations: 1.5 MGD WWTP

| PARAMETER                         | BASIS FOR LIMITS * | DISCHARGE LIMITS                |                    |         |         | MONITORING REQUIREMENTS                 |                                   |
|-----------------------------------|--------------------|---------------------------------|--------------------|---------|---------|---|-----------------------------------|
|                                   |                    | MONTHLY AVERAGE                 | WEEKLY AVERAGE     | MINIMUM | MAXIMUM | FREQUENCY                               | SAMPLE TYPE                       |
| Flow                              | NA                 | NL                              | NA                 | NA      | NL      | Continuous                              | Totalizing Indicating & Recording |
| PH                                | 2                  | NA                              | NA                 | 6.0 SU  | 9.0 SU  | 1/Day                                   | Grab                              |
| BOD <sub>5</sub>                  | 1,4,5              | 10 mg/l<br>57 kg/d              | 15 mg/l<br>85 kg/d | NA      | NA      | 5 Days/Wk.                              | 24 Hour Composite                 |
| Total Suspended Solids            | 1,4                | 10 mg/l<br>57 kg/d              | 15 mg/l<br>85 kg/d | NA      | NA      | 5 Days/Wk.                              | 24 Hour Composite                 |
| Ammonia Nitrogen (June 1-Nov. 30) | 2,5                | 1.7 mg/l                        | 2.1 mg/l           | NA      | NA      | 5 Days/Wk.                              | 24 Hour Composite                 |
| Ammonia Nitrogen (Dec. 1-May 31)  | 2,5                | 2.2 mg/l                        | 2.8 mg/l           | NA      | NA      | 5 Days/Wk.                              | 24 Hour Composite                 |
| Dissolved Oxygen                  | 2,5                | NA                              | NA                 | 4.0     | NA      | 1/Day                                   | Grab                              |
| E.coli, n/100 ml                  | 2,4                | 11 n/100 ml<br>(Geometric Mean) | NA                 | NA      | NA      | 5 Days/Wk. between 10:00 am and 4:00 pm | Grab                              |

- \*1. Federal Effluent guidelines
- 2. Water Quality-based Limits
- 3. Best Engineering Judgment
- 4. Best Professional Judgment
- 5. Other (e.g wasteload allocation model)

17. Basis for Sludge Use & Disposal Requirements: VPDES Permit Regulation, 9VAC25-31-100 P; 220 B.2.; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit

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information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

18. Antibacksliding Statement: Since this permit is a new issuance, the antibacksliding provisions of the Permit Regulation (9 VAC 25-31-220.1) do not apply.
19. Compliance Schedules: None

Special Conditions:

**PART I.B. Special Condition - Compliance Reporting**

**Rationale:** Authorized by VPDES Permit Regulation, 9VAC25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

**PART I.C. Special Condition - Control of Significant Dischargers**

**Rationale:** VPDES Permit Regulation, 9VAC25-31-730 through 900, and 40 CFR part 403 require certain existing and new sources of pollution to meet specified regulations.

**PART I.D. Special Condition - Whole Effluent Toxicity Testing For 1.0 MGD and 1.5 MGD Facility**

**Rationale:** VPDES Permit Regulation, 9 VAC25-31-210 and 220 I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act.

**PART I.E. Other Requirements and Special Conditions:**

**1. 95% Capacity Reopener**

**Rationale:** Required by VPDES Permit Regulation, 9VAC25-31-200 B 4 for all POTW and PVOTW permits

**2. Indirect Dischargers**

**Rationale:** Required by VPDES Permit Regulation, 9VAC25-31-200 B 1 and B 2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

**3. CTC, CTO Requirement**

**Rationale:** Required by the Code of Virginia § 62.1-44.19: Sewage Collection and Treatment Regulations, 9VAC25-790.

**4. Operation and Maintenance Manual Requirement**

**Rationale:** Required by the Code of Virginia § 62.1-44.19: Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190 E.

**5. Licensed Operator Requirement**

**Rationale:** The VPDES Permit Regulation, 9VAC25-31-200 C and the Code of Virginia § 54.1-2300 et seq, Board for Waterworks and Wastewater Works

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Operators and Onsite Sewage System Professional Regulations (18VAC160-20-10 et seq.), require licensure of operators.

**6. Reliability Class**

**Rationale:** Required by the Sewage Collection and Treatment Regulations, 9 VAC25-790 for all municipal facilities.

**7. Treatment Works Closure Plan**

**Rationale:** This condition establishes the requirement to submit a closure plan for the treatment works if the treatment facility is being replaced or is expected close. This is necessary to ensure treatment works are properly closed so that the risk of untreated waste water discharge, spills, leaks, or other exposure to raw materials is eliminated and water quality is maintained. Section 62.1-44.21 requires every owner to furnish when requested plans, specifications, and other pertinent informations as may be necessary to determine the effect of the wastes from this discharge on the quality of state waters, or such other information as may be necessary to accomplish the purpose of the State Water Control Law.

**8. Section 303(d) List (TMDL) Reopener**

**Rationale:** Section 303(d) of the Clean Water Act requires the total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it in compliance with any applicable TMDL approved for the receiving stream. The reopener recognizes that, according to Section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in the permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under Section 303 of the Act.

**9. Sludge Reopener**

**Rationale:** Required by VPDES Permit Regulation, 9VAC25-31-220 C for all permits issued to treatment works treating domestic sewage.

**10. Sludge Use and Disposal**

**Rationale:** VPDES Permit Regulation, 9VAC25-31-100 P; 220 B.2.; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

**11. Water Quality Criteria Monitoring in Attachment A:**

**Rationale:** State Water Control Law §62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. States are required to review data on discharges to identify actual or potential toxicity problems, or the attainment of water quality goals, according to 40 CFR Part 131, Water Quality Standards, subpart 131.11. To ensure that water quality criteria are maintained, the permittee is required to analyze the facility's effluent for the substances noted in Attachment A of this VPDES permit.

**12. Ammonia Nitrogen Removal:**

**Rationale:** In April, 2013 EPA adopted new AQUATIC LIFE AMBIENT WATER

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QUALITY CRITERIA FOR AMMONIA - FRESHWATER 2013. These criteria are more protective of aquatic life than the existing criteria in the Virginia Water Quality Standards. Although the new EPA criteria have not yet been adopted by Virginia, the wastewater treatment facilities should be designed to consistently achieve compliance with these new EPA criteria.

13. **PCBs Monitoring:**

**Rationale:** State Water Control Law §62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. States are required to review data on discharges to identify actual or potential toxicity problems, or the attainment of water quality goals, according to 40 CFR Part 131, Water Quality Standards, Subpart 131.11.

**PART II, Conditions Applicable to All Permits**

**Rationale:** VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

20. Changes from the previous permit: NA
22. Regulation of Users: 9 VAC 25-31-280 B 9 - NA
23. Public Notice Information required by 9 VAC 25-31-280 B:

**HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING:** DEQ accepts comments and requests for public hearing by hand delivery, e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all the persons represented by the commenter/requester. A request for a public hearing must also include; 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit and suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

**CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION:**

Name: Fred M. Wyatt

Address: DEQ, Southwest Regional Office, 355-A Deadmore Street, Abingdon, VA 24210; Phone: (276) 676-4810 E-mail: [frederick.wyatt@deq.virginia.gov](mailto:frederick.wyatt@deq.virginia.gov) Fax: (276) 676-4899

24. Additional Comments:

Previous Board Action: None

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Staff Comments:

*Threatened or Endangered Species:* According to the attached printout from the Virginia Fish and Wildlife Information Service, no threatened or endangered species have been confirmed in Beaver Creek. However, since this permit is for a new issuance, the issuance is being coordinated with the US Fish and Wildlife Service (USFWS), the Virginia Department of Game and Inland Fisheries (DGIF) and the Department of Conservation and Recreation (DCR).

*Permit Fee:* The applicant has paid the permit issuance fee for a major facility of \$21,000.

Public Comments:

24. 303(d) listed segments (TMDL): See Item #13, page 2 above.

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**PLANNING CONCURRENCE FOR MUNICIPAL VPDES PERMIT**

**PERMIT NO.** VA0092860

**FACILITY:** Western Washington County Water Reclamation Facility

**COUNTY:** Washington

1. The discharge is in conformance with the existing planning documents for the area.
2. The discharge is not addressed in any planning document but will be included, if required, when the plan is updated.
3. Other.

Martha Chapman  
TMDL Coordinator

25 Sept 2015  
Date

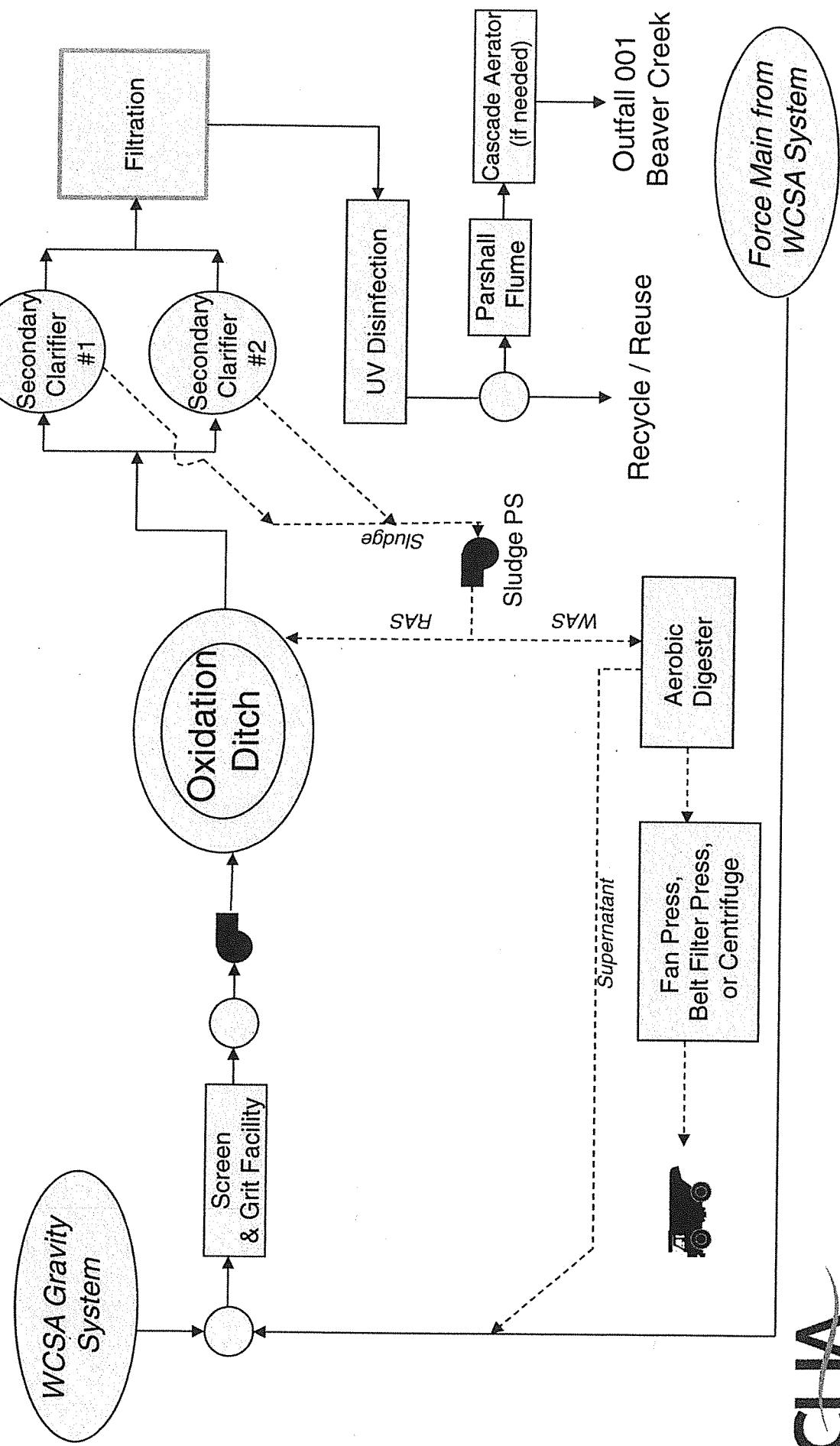


## ATTACHMENT 1

### Treatment Process Diagrams & Description

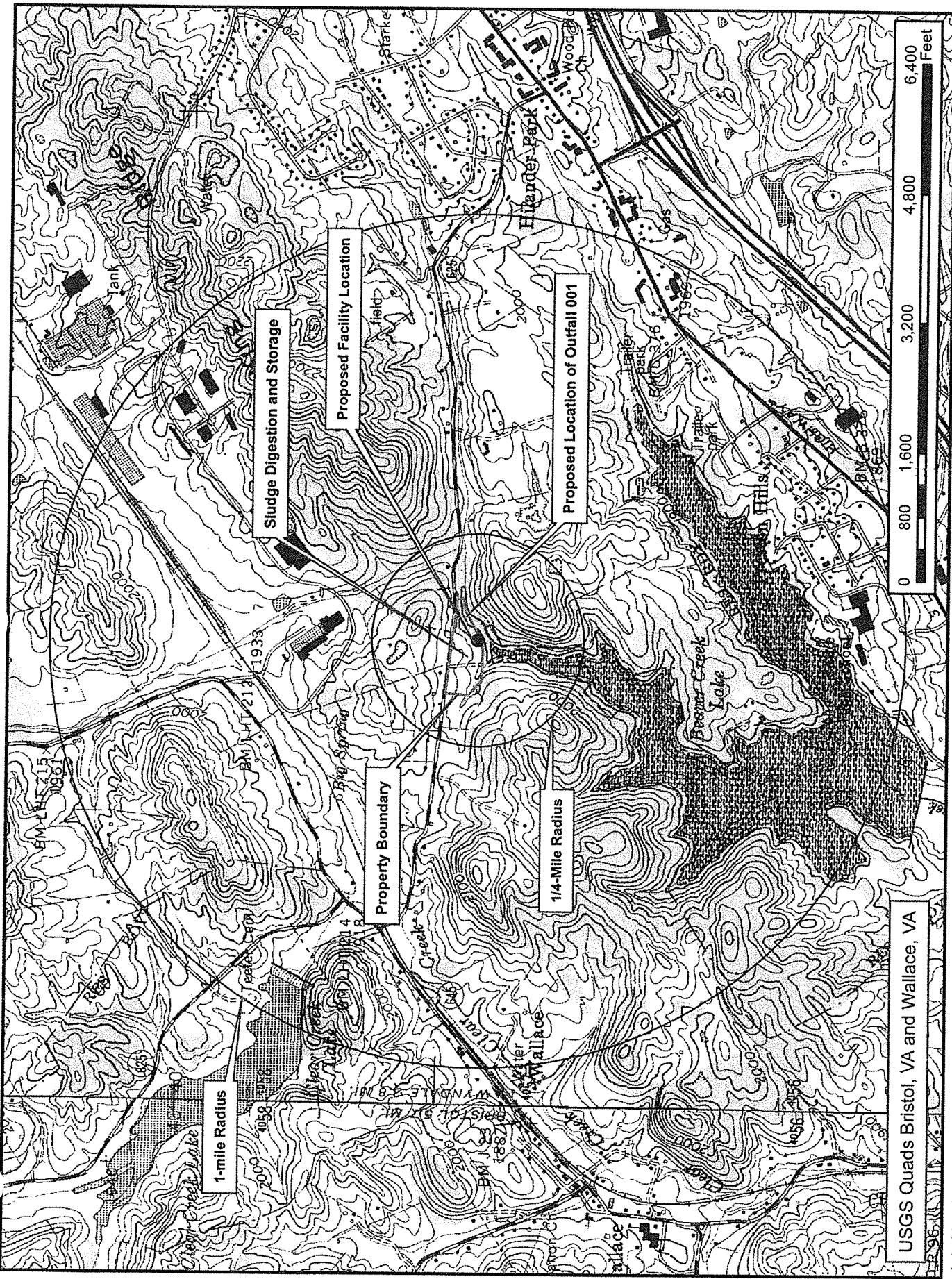
Figure 2

Western Washington County Water Reclamation Facility  
Proposed Flow Schematic



CH2M

ATTACHMENT 2  
Discharge Location



Western Washington County Water Reclamation Facility  
Approximate Site Location Map

Figure 1

**ATTACHMENT 3**

**Permit Limitations Development**

Parm. Code  
Name

| Station ID  | Collection Date Time | Temp Celcius | DO    | Field Ph | Specific Conductance |
|-------------|----------------------|--------------|-------|----------|----------------------|
| 6CBEV015.27 | 01/08/2009 13:25     | 8.1          | 10.7  | 7.9      | 508                  |
|             | 03/25/2009 12:55     | 12.2         | 10.3  | 8.1      | 481                  |
|             | 05/18/2009 14:55     | 14.7         | 9.6   | 8        | 462                  |
|             | 07/20/2009 12:45     | 18.4         | 9     | 8        | 471                  |
|             | 09/14/2009 11:50     | 17.8         | 9.3   | 8        | 464                  |
|             | 11/05/2009 08:50     | 9.2          | 11.1  | 7.8      | 496                  |
|             | 01/13/2010 08:45     | 3.7          | 12.4  | 7.7      | 414                  |
|             | 03/29/2010 09:55     | 10.5         | 9.9   | 7.7      | 465                  |
|             | 05/19/2010 08:55     | 16.1         | 8.8   | 8.1      | 472                  |
|             | 07/22/2010 11:25     | 22.4         | 7.6   | 8.1      | 474                  |
|             | 09/30/2010 09:45     | 16.5         | 7.9   | 8.1      | 476                  |
|             | 11/09/2010 09:10     | 7.3          | 11    | 8        | 503                  |
|             | 09/13/2012 10:00     | 17.3         | 8.33  | 7.89     | 504                  |
|             | 10/15/2012 11:30     | 15.9         | 8.6   | 7.6      | 336                  |
|             | 11/26/2012 14:10     | 6            | 13.8  | 8.3      | 477                  |
|             | 12/17/2012 14:20     | 10.63        | 11.5  | 8.28     | 469                  |
|             | 01/03/2013 12:50     | 7.7          | 12.3  | 8.24     | 472                  |
|             | 02/06/2013 13:00     | 8.83         | 11.56 | 8.1      | 490                  |
|             | 03/04/2013 14:20     | 8.41         | 12.49 | 8.44     | 475                  |
|             | 04/02/2013 15:00     | 12.01 12.50  |       | 8.58     | 449                  |
|             | 05/01/2013 15:20     | 17 9.70      |       | 8.3      | 466                  |
|             | 06/12/2013 13:15     | 19.83 8.89   |       | 8.3      | 467                  |
| 6CBEV020.86 | 09/13/2012 10:15     | 16.15        | 8.83  | 7.79     | 478                  |
|             | 10/15/2012 12:40     | 15.7         | 9.5   | 7.6      | 429                  |
|             | 11/26/2012 13:50     | 6.7          | 12.9  | 8.3      | 456                  |
|             | 12/17/2012 14:30     | 10.65        | 11.16 | 8.23     | 454                  |
|             | 01/03/2013 13:00     | 7.99         | 11.65 | 8.21     | 450                  |
|             | 02/06/2013 13:20     | 9.42         | 10.96 | 8.07     | 460                  |
|             | 03/04/2013 14:40     | 9.66         | 12.5  | 8.44     | 451                  |
|             | 04/02/2013 15:20     | 13.08 12.09  |       | 8.55     | 381                  |
|             | 05/01/2013 15:55     | 17.8 9.50    |       | 8.2      | 454                  |
|             | 06/12/2013 13:45     | 19.97 8.56   |       | 8.32     | 458                  |
|             | 02/11/2015 16:15     | 9.75 12.44   |       | 8.51     | 454                  |
|             | 04/30/2015 09:30     | 12.99 10.00  |       | 8.09     | 461                  |
| 6CBEV022.29 | 09/13/2012 10:25     | 15.08        | 8.51  | 7.7      | 452                  |
|             | 10/15/2012 12:50     | 14.5         | 9.4   | 7.7      | 388                  |
|             | 12/17/2012 14:50     | 11.04        | 9.93  | 8.34     | 414                  |
|             | 01/03/2013 13:20     | 8.51         | 10.92 | 8.3      | 413                  |
|             | 02/06/2013 13:40     | 10.15        | 10.61 | 8.25     | 305                  |
|             | 03/04/2013 15:00     | 10.7         | 12    | 8.55     | 407                  |
|             | 04/02/2013 15:40     | 13.66 11.70  |       | 8.79     | 382                  |
|             | 05/01/2013 15:45     | 17.5 9.60    |       | 8.4      | 151                  |
|             | 06/12/2013 14:00     | 17.83 9.07   |       | 8.37     | 424                  |

|                                    |  |                                   |   |   |  |
|------------------------------------|--|-----------------------------------|---|---|--|
| 00500                              | 00530  | 00600                             | 00625   | 82079   | 00900                                    |
| TS RESIDUE, TSS<br>TOTAL<br>(MG/L) | RESIDUE,<br>TOTAL<br>NONFILTRAB<br>LE (MG/L) | NITROGEN,<br>TOTAL (MG/L<br>AS N) | NITROGEN,<br>KJELDAHL,<br>TOTAL,<br>(MG/L AS N) | TURBIDITY,L<br>AB<br>NEPHELOME<br>TRIC<br>TURBIDITY | HARDNESS,<br>TOTAL<br>(MG/L AS<br>CACO3) |

| Value | Value | Value | Value | Value | Value |
|-------|-------|-------|-------|-------|-------|
|-------|-------|-------|-------|-------|-------|

|       |
|-------|
| 3.580 |
| 2.160 |
| 2.200 |
| 1.730 |
| 1.960 |
| 1.840 |
| 2.590 |
| 1.960 |
| 1.660 |
| 1.500 |
| 1.450 |
| 1.460 |

|         |       |       |      |       |         |
|---------|-------|-------|------|-------|---------|
| 279.000 | 9.000 | 1.970 | .100 | 8.230 | 256.000 |
| 278.000 | 9.000 | 2.110 | .100 | 5.620 | 235.000 |

## MODEL FILE AND STREAM INSPECTION REPORT FORM

Page 1

Discharge Name: WC SA WWTPLocation: Headwaters of Beaver Creek Lake

Model File Path/Name: \_\_\_\_\_

Inspection Date: 1/1/ Modeler: \_\_\_\_\_General Stream Information:Stream Name: Beaver CreekBasin: Tennessee River Subbasin Section: 4 Class: Y Special Standards: NoneAre the standards for this stream violated due to natural causes? (Y/N) NIs the stream correctly classified? (Y/N) Y

If "N", what is the correct classification? \_\_\_\_\_

Model Segmentation:Number of segments to be modeled: 1Flow Gauge / Flow Frequency Information (Attach Copy):Gauge Used: Beaver Creek Near WallaceDrainage Area/Observed Flow At The Gauge: 13.7 sq. mi./mgdDrainage Area/Observed Flow At The Start of The Model: 12.14 sq. mi./mgd7Q10 of the Gauge: 2.00 mgd

Flow Adjustment for Springs or Dischargers: \_\_\_\_\_ mgd

Background Water Quality:Elevation at the Start of the model: 1900 ft above mean sea levelElevation at the End of the model: 1800 ft above mean sea levelCritical Temperature: 20 C. (attach data and analysis)Ambient Monitoring Gauge Used: Beaver Creek Near WallaceAdditional Discharges Information:Is there a discharger within 3 miles upstream of the proposed discharge? (Y/N) NDoes antidegradation apply to this analysis? (Y/N) Y If so, which segment(s)? \_\_\_\_\_Is any segment on the current 303(d) list for D.O. violations? (Y/N) NIs any segment of the model within an approved D.O. TMDL segment? (Y/N) NOIs any discharge to the model intermittent? (Y/N) NAny dams in stream section being modeled? (Y/N) NNotes/Sketch:

$$7Q10 = 2.00 \text{ mgd} \times 12.14 / 13.7 = 1.77 \text{ mgd}$$

$$HF7Q10 = 2.00 \text{ mgd} \times 12.14 / 13.7 = 1.77 \text{ mgd}$$

$$1Q10 = 1.94 \text{ mgd} \times 12.14 / 13.7 = 1.70 \text{ mgd}$$

$$HF1Q10 = 2.00 \text{ mgd} \times 12.14 / 13.7 = 1.77 \text{ mgd}$$

$$30Q10 = 2.26 \text{ mgd} \times 12.14 / 13.7 = 2.00 \text{ mgd}$$

$$HF30Q10 = 2.46 \text{ mgd} \times 12.14 / 13.7 = 2.18 \text{ mgd}$$

**MODEL FILE AND STREAM INSPECTION REPORT FORM**  
Page 2

(Fill In This Page FOR EACH SEGMENT To Be Modeled)

|   |  |  |   |  |                                     |                                   |
|---|--|--|---|--|-------------------------------------|-----------------------------------|
| <b>Segment Number:</b>  |  |  |   |  |                                     |                                   |
| <b>Reason for Defining Segment:</b>   |  | Discharge at Beginning of Segment        | X   |  |                                     |                                   |
|   |  | Physical Change at Beginning of Segment  |   |  |                                     |                                   |
|   |  | Tributary at Beginning of Segment        |   |  |                                     |                                   |
| <b>Length of Segment (mi.):</b>   |  | 1.8                                      |   |  |                                     |                                   |
| <b>Drainage Area at Start of Segment (sq. mi.):</b>   |  | 12.14                                    |   |  |                                     |                                   |
| <b>Drainage Area at End of Segment (sq. mi.):</b>   |  | 14.3                                     |   |  |                                     |                                   |
| <b>Elevation at Start of Segment (ft.):</b>   |  | 1900                                     |   |  |                                     |                                   |
| <b>Elevation at End of Segment (ft.):</b>   |  | 1800                                     |   |  |                                     |                                   |
| <b>If Discharge or Tributary At Beginning of Segment, Complete the Following:</b>   |  |  |   |  |                                     |                                   |
| <b>Discharge/Tributary Name:</b>  |  |  |   |  |                                     |                                   |
| <b>Discharge/Tributary Temperature (C):</b> (If different from background ambient)  |  | 20                                       |   |  |                                     |                                   |
| <b>Critical Discharge/Tributary Flow (mgd):</b> (Design/Permitted Flow or 7Q10 Condition)<br>(use permitted or design flow for discharges, 7Q10 flow from flow frequency analysis for tributaries)  |  | 0.5, 1.0, 1.5                            |   |  |                                     |                                   |
| <b>For Dischargers Only:</b><br><br>(use permitted<br>Concentrations)   | <b>CBOD<sub>5</sub> (mg/l):</b>          | 25                                       |   |  |                                     |                                   |
|   | <b>TKN (mg/l):</b>                       | 6.8, 5.2, 4.7                            |   |  |                                     |                                   |
|   | <b>D.O. (mg/l):</b>                      | 6.5                                      |   |  |                                     |                                   |
| <b>General Type of Cross Section in Segment: (7Q10 Condition)</b>   |  |  |   |  |                                     |                                   |
| Rectangular <input checked="" type="checkbox"/> Triangular <input type="checkbox"/> Deep Narrow U <input type="checkbox"/> Wide Shallow Arc <input type="checkbox"/> Irregular <input type="checkbox"/> No Defined Channel <input type="checkbox"/> |  |  |   |  |                                     |                                   |
| <b>General Channel Characteristics of Segment: (7Q10 Condition)</b>   |  |  |   |  |                                     |                                   |
| Mostly Straight <input checked="" type="checkbox"/> Moderately Meandering <input type="checkbox"/> Severely Meandering <input type="checkbox"/> No Defined Channel <input type="checkbox"/>   |  |  |   |  |                                     |                                   |
| <b>Does the stream have a pool and riffle character (Y/N)? (7Q10 Condition)</b>   |  |  |   |  |                                     |                                   |
| <b>If "Y":</b>  | % of length that is pools <u>50</u>      |  | Average depth of pools (ft) _____           |  |                                     |                                   |
|   | % of length that is riffles <u>50</u>    |  | Average depth of riffles (ft) _____         |  |                                     |                                   |
| <b>Bottom:</b>  | Sand <input type="checkbox"/>            | Silt <input type="checkbox"/>            | Gravel <input type="checkbox"/>             | Small Rock <input type="checkbox"/>            | Large Rock <input type="checkbox"/> | Boulders <input type="checkbox"/> |
| <b>Sludge Deposits:</b>   | None <input checked="" type="checkbox"/> | Trace <input type="checkbox"/>           | Light <input type="checkbox"/>              | Heavy <input type="checkbox"/>                 |                                     |                                   |
| <b>Plants:</b>  | <u>Rooted:</u>                           | None <input checked="" type="checkbox"/> | Few <input type="checkbox"/>                | Light <input type="checkbox"/>                 | Heavy <input type="checkbox"/>      |                                   |
|   | <u>Algae:</u>                            | None <input checked="" type="checkbox"/> | Film on Edges Only <input type="checkbox"/> | Film on Entire Bottom <input type="checkbox"/> |                                     |                                   |
| <b>Projected 7Q10 Width of Segment (ft):</b> (must be projected by modeler based on site visit)   |  |  |   |  | 12                                  |                                   |
| <b>Projected 7Q10 Depth of Segment (ft):</b> (can be calculated by model based on width)  |  |  |   |  |                                     |                                   |
| <b>Projected 7Q10 Velocity of Segment (ft):</b> (can be calculated by model based on width)   |  |  |   |  |                                     |                                   |
| <b>Does the water have an evident green color? (Y/N)</b>  |  |  |   |  |                                     |                                   |

## Mixing Zone Predictions for                   Western Wash Co. Water Rec. Facility

Effluent Flow = 0.5 MGD

Stream 7Q10 = 1.77 MGD

Stream 30Q10 = 2.00 MGD

Stream 1Q10 = 1.70 MGD

Stream slope = 0.0105 ft/ft

Stream width = 10 ft

Bottom scale = 3

Channel scale = 1

---

### Mixing Zone Predictions @ 7Q10

Depth = .4541 ft

Length = 173.97 ft

Velocity = .7738 ft/sec

Residence Time = .0026 days

#### Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

---

### Mixing Zone Predictions @ 30Q10

Depth = .4821 ft

Length = 164.96 ft

Velocity = .8027 ft/sec

Residence Time = .0024 days

#### Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

---

### Mixing Zone Predictions @ 1Q10

Depth = .4448 ft

Length = 177.36 ft

Velocity = .7647 ft/sec

Residence Time = .0644 hours

#### Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

---

Mixing Zone Predictions for                    Western Wash Co. Water Rec. Facility

Effluent Flow = 1.0 MGD  
Stream 7Q10 = 1.77 MGD  
Stream 30Q10 = 2.00 MGD  
Stream 1Q10 = 1.70 MGD  
Stream slope = 0.0105 ft/ft  
Stream width = 10 ft  
Bottom scale = 3  
Channel scale = 1

---

Mixing Zone Predictions @ 7Q10

Depth        = .5138 ft  
Length       = 155.84 ft  
Velocity     = .8344 ft/sec  
Residence Time = .0022 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

---

Mixing Zone Predictions @ 30Q10

Depth        = .5401 ft  
Length       = 148.98 ft  
Velocity     = .8597 ft/sec  
Residence Time = .002 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

---

Mixing Zone Predictions @ 1Q10

Depth        = .5058 ft  
Length       = 158.02 ft  
Velocity     = .8263 ft/sec  
Residence Time = .0531 hours

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

---



## Mixing Zone Predictions for Western Wash Co. Water Rec. Facility

Effluent Flow = 1.5 MGD  
Stream 7Q10 = 1.77 MGD  
Stream 30Q10 = 2.00 MGD  
Stream 1Q10 = 1.70 MGD  
Stream slope = 0.0105 ft/ft  
Stream width = 10 ft  
Bottom scale = 3  
Channel scale = 1

---

### Mixing Zone Predictions @ 7Q10

Depth = .5698 ft  
Length = 142.04 ft  
Velocity = .888 ft/sec  
Residence Time = .0019 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

---

### Mixing Zone Predictions @ 30Q10

Depth = .5948 ft  
Length = 136.58 ft  
Velocity = .9108 ft/sec  
Residence Time = .0017 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

---

### Mixing Zone Predictions @ 1Q10

Depth = .5623 ft  
Length = 143.73 ft  
Velocity = .8808 ft/sec  
Residence Time = .0453 hours

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

---



Calculation of Total Ammonia Nitrogen Limits

Facility Name: Western Washington County Water Reclamation Facility  
 VPDES Permit No: VA 00 Q2860  
 Stream Name: Beaver Creek  
 Stream Tier Designation: I

NH<sub>3</sub>-N limits are derived from the ammonia tables or formulas in the Water Quality Standards. Human Health standards are not applicable for ammonia.

The following stream parameter values are being used for the calculations. The dry season is June - November and the wet season is December - May.

$$\begin{array}{l} \text{Dry Season pH} = 8.55 \\ \text{Wet Season pH} = 8.55 \end{array}$$

$$\begin{array}{l} \text{Dry Season Temperature (deg.C)} = 20 \\ \text{Wet Season Temperature (deg.C)} = 14 \end{array}$$

The ammonia nitrogen water quality standards (WQS) are:

$$\text{Acute: } AC_{\text{dry}} = 1.96$$

$$AC_{\text{wet}} = 1.96$$

$$\text{Chronic: } CC_{\text{dry}} = 0.70$$

$$CC_{\text{wet}} = 1.00$$

The following flows apply:

$$\begin{array}{ll} Q_e = \text{Design Flow of STP(MGD)} & = 0.5 \\ Q_{s-1} = 1Q10 \text{ Flow (MGD)} & = 1.70 \\ Q_{s-1w} = 1Q10 \text{ High Flow (MGD)} & = 1.77 \\ Q_{s-30} = 30Q10 \text{ Flow (MGD)} & = 2.00 \\ Q_{s-30w} = 30Q10 \text{ High Flow (MGD)} & = 2.18 \end{array}$$

The water quality wasteload allocations (WLAs) are calculated as follows:

f = fraction of stream flow to use from MIX Program

Acute:

$$\begin{aligned} \text{Dry WLA}_a &= [AC_{\text{dry}}((f)Q_{s-1} + Q_e) - (f)(Q_{s-1})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Dry WLA}_a &= [1.96(( ) 1.70 + 0.5) - ( )( ) (0)] / (0.5) \text{ mg/l} \\ \text{Dry WLA}_a &= 8.62 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_a &= [AC_{\text{wet}}((f)Q_{s-1w} + Q_e) - (f)(Q_{s-1w})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Wet WLA}_a &= [1.96(( ) 1.77 + 0.5) - ( )( ) (0)] / (0.5) \text{ mg/l} \\ \text{Wet WLA}_a &= 8.89 \text{ mg/l} \end{aligned}$$

Chronic:

$$\begin{aligned} \text{Dry WLA}_c &= [CC_{\text{dry}}((f)Q_{s-30} + Q_e) - (f)(Q_{s-30})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Dry WLA}_c &= [0.70(( ) 2.00 + 0.5) - ( )( ) (0)] / (0.5) \text{ mg/l} \\ \text{Dry WLA}_c &= 3.50 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_c &= [CC_{\text{wet}}((f)Q_{s-30w} + Q_e) - (f)(Q_{s-30w})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Wet WLA}_c &= [1.00(( ) 2.18 + 0.5) - ( )( ) (0)] / (0.5) \text{ mg/l} \\ \text{Wet WLA}_c &= 5.36 \text{ mg/l} \end{aligned}$$

6/8/2015 9:38:03 AM

Facility = Washington County Water Reclamation Facility, 0.5 MGD, Dry Season  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAA = 8.62  
WLAC = 3.5  
Q.L. = 0.2  
# samples/mo. = 12  
# samples/wk. = 3

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 7.06184532695709  
Average Weekly limit = 5.16534227422404  $\approx$  5.2 mg/l  
Average Monthly Limit = 3.8475048601624  $\approx$  3.8 mg/l

The data are:

6/8/2015 9:43:38 AM

Facility = Western Washington County Water Reclamation Facility, 0.5 MGD, Wet Season  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAA = 8.89  
WLAC = 5.36  
Q.L. = 0.2  
# samples/mo. = 12  
# samples/wk. = 3

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity  
Maximum Daily Limit = 8.89  
Average Weekly limit = 6.50253449230364 ≈ 6.5 mg/l  
Average Monthly Limit = 4.84353828542181 ≈ 4.8 mg/l

The data are:

modout.txt  
"Model Run For C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.mod On  
6/25/2015 1:53:53 PM"

"Model is for BEAVER CREEK LAKE."

"Model starts at the WASHINGTON COUNTY SERVICE AUTHORITY WWTP discharge."

"Background Data"

"7Q10", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.7723, 2, 0, 7.643, 20

"Discharge/Tributary Input Data for Segment 1"

"Flow", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
.5, 25, 6.8, 6.5, 20

~~30 BODs NH<sub>3</sub>-N = 3.8 mg/l~~

"Hydraulic Information for Segment 1"

"Length", "width", "Depth", "velocity"  
"(mi)", "(ft)", "(ft)", "(ft/sec)"  
1.8, 10.001, .455, .773

"Initial Mix Values for Segment 1"

"Flow", "DO", "CBOD", "nBOD", "DOsat", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
2.2723, 7.391, 17.653, 3.621, 8.508, 20

"Rate Constants for Segment 1. - (All units Per Day)"

"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"  
1, 1, 20, 20, .35, .35, 0, 0

"Output for Segment 1"

"Segment starts at WASHINGTON COUNTY SERVICE AUTHORITY WWTP"

"Total", "Segm."

"Dist.", "Dist.", "DO", "cBOD", "nBOD"  
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"  
0, 0, 7.391, 17.653, 3.621  
.1, .1, 7.416, 17.514, 3.611  
.2, .2, 7.439, 17.376, 3.601  
.3, .3, 7.46, 17.239, 3.591  
.4, .4, 7.478, 17.103, 3.581  
.5, .5, 7.495, 16.968, 3.571  
.6, .6, 7.51, 16.834, 3.561  
.7, .7, 7.524, 16.701, 3.551  
.8, .8, 7.537, 16.569, 3.541  
.9, .9, 7.549, 16.439, 3.531  
1, 1, 7.56, 16.31, 3.521  
1.1, 1.1, 7.571, 16.182, 3.511  
1.2, 1.2, 7.581, 16.055, 3.501  
1.3, 1.3, 7.591, 15.929, 3.491  
1.4, 1.4, 7.6, 15.804, 3.481  
1.5, 1.5, 7.609, 15.68, 3.471  
1.6, 1.6, 7.617, 15.557, 3.461  
1.7, 1.7, 7.625, 15.434, 3.451  
1.8, 1.8, 7.633, 15.312, 3.441

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0  
**Model Input File for the Discharge  
to BEAVER CREEK LAKE.**

**File Information**

File Name: C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.  
Date Modified: June 25, 2015

**Water Quality Standards Information**

Stream Name: BEAVER CREEK LAKE  
River Basin: Tennessee/Big Sandy Rivers Basin  
Section: 4  
Class: V - Stockable Trout Waters  
Special Standards: None

**Background Flow Information**

Gauge Used: Beaver Creek Near Wallace  
Gauge Drainage Area: 13.7 Sq.Mi.  
Gauge 7Q10 Flow: 2 MGD  
Headwater Drainage Area: 12.14 Sq.Mi.  
Headwater 7Q10 Flow: 1.772263 MGD (Net; includes Withdrawals/Discharges)  
Withdrawal/Discharges: 0 MGD  
Incremental Flow in Segments: 0.1459854 MGD/Sq.Mi.

**Background Water Quality**

Background Temperature: 20 Degrees C  
Background cBOD5: 2 mg/l  
Background TKN: 0 mg/l  
Background D.O.: 7.642516 mg/l

**Model Segmentation**

Number of Segments: 1  
Model Start Elevation: 1900 ft above MSL  
Model End Elevation: 1800 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0  
Model Input File for the Discharge  
to BEAVER CREEK LAKE.

**Segment Information for Segment 1**

**Definition Information**

Segment Definition: A discharge enters.  
Discharge Name: WASHINGTON COUNTY SERVICE AUTHORITY WWTP  
VPDES Permit No.:

**Discharger Flow Information**

Flow: 0.5 MGD  
cBOD5: 25 mg/l  
TKN: 6.8 mg/l  
D.O.: 6.5 mg/l  
Temperature: 20 Degrees C

**Geographic Information**

Segment Length: 1.8 miles  
Upstream Drainage Area: 12.14 Sq.Mi.  
Downstream Drainage Area: 0 Sq.Mi.  
Upstream Elevation: 1900 Ft.  
Downstream Elevation: 1800 Ft.

**Hydraulic Information**

Segment Width: 10.001 Ft.  
Segment Depth: 0.455 Ft.  
Segment Velocity: 0.773 Ft./Sec.  
Segment Flow: 2.272 MGD  
Incremental Flow: -1.772 MGD (Applied at end of segment.)

**Channel Information**

Cross Section: Rectangular  
Character: Mostly Straight  
Pool and Riffle:  
    Percent Pools: 50  
    Percent Riffles: 50  
    Pool Depth: 0.5 Ft.  
    Riffle Depth: 0.4 Ft.  
Bottom Type: Small Rock  
Sludge: None  
Plants: None  
Algae: None

modout.txt  
"Model Run For C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.mod on  
8/27/2015 1:42:23 PM"

"Model is for BEAVER CREEK LAKE."

"Model starts at the WASHINGTON COUNTY SERVICE AUTHORITY WWTP discharge."

"Background Data"

"7Q10", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.7723, 2, 0, 7.643, 20

"Discharge/Tributary Input Data for Segment 1"

"Flow", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
.5, 8, 6.8, 1, 20

3.8 N43N

"Hydraulic Information for Segment 1"

"Length", "Width", "Depth", "Velocity"  
"(mi)", "(ft)", "(ft)", "(ft/sec)"  
1.8, 10.001, .455, .773

"Initial Mix Values for Segment 1"

"Flow", "DO", "CBOD", "nBOD", "dosat", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
2.2723, 6.181, 8.301, 3.621, 8.508, 20

"Rate Constants for Segment 1. - (All units Per Day)"

"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"  
.8, .8, 20, 20, .35, .35, 0, 0

"Output for Segment 1"

"Segment starts at WASHINGTON COUNTY SERVICE AUTHORITY WWTP"

"Total", "Segm."

"Dist.", "Dist.", "DO", "CBOD", "nBOD"  
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"  
0, 0, 6.181, 8.301, 3.621  
.1, .1, 6.464, 8.249, 3.611  
.2, .2, 6.706, 8.197, 3.601  
.3, .3, 6.912, 8.145, 3.591  
.4, .4, 7.089, 8.094, 3.581  
.5, .5, 7.24, 8.043, 3.571  
.6, .6, 7.369, 7.992, 3.561  
.7, .7, 7.48, 7.942, 3.551  
.8, .8, 7.575, 7.892, 3.541  
.9, .9, 7.656, 7.842, 3.531  
1, 1, 7.657, 7.793, 3.521  
1.1, 1.1, 7.657, 7.744, 3.511  
1.2, 1.2, 7.657, 7.695, 3.501  
1.3, 1.3, 7.657, 7.646, 3.491  
1.4, 1.4, 7.657, 7.598, 3.481  
1.5, 1.5, 7.657, 7.55, 3.471  
1.6, 1.6, 7.657, 7.502, 3.461  
1.7, 1.7, 7.657, 7.455, 3.451  
1.8, 1.8, 7.657, 7.408, 3.441

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0  
**Model Input File for the Discharge  
to BEAVER CREEK LAKE.**

**File Information**

File Name: C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.  
Date Modified: August 27, 2015

**Water Quality Standards Information**

Stream Name: BEAVER CREEK LAKE  
River Basin: Tennessee/Big Sandy Rivers Basin  
Section: 4  
Class: V - Stockable Trout Waters  
Special Standards: None

**Background Flow Information**

Gauge Used: Beaver Creek Near Wallace  
Gauge Drainage Area: 13.7 Sq.Mi.  
Gauge 7Q10 Flow: 2 MGD  
Headwater Drainage Area: 12.14 Sq.Mi.  
Headwater 7Q10 Flow: 1.772263 MGD (Net; includes Withdrawals/Discharges)  
Withdrawal/Discharges: 0 MGD  
Incremental Flow in Segments: 0.1459854 MGD/Sq.Mi.

**Background Water Quality**

Background Temperature: 20 Degrees C  
Background cBOD5: 2 mg/l  
Background TKN: 0 mg/l  
Background D.O.: 7.642516 mg/l

**Model Segmentation**

Number of Segments: 1  
Model Start Elevation: 1900 ft above MSL  
Model End Elevation: 1800 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0  
Model Input File for the Discharge  
to BEAVER CREEK LAKE.

**Segment Information for Segment 1**

**Definition Information**

Segment Definition: A discharge enters.  
Discharge Name: WASHINGTON COUNTY SERVICE AUTHORITY WWTP  
VPDES Permit No.:

**Discharger Flow Information**

Flow: 0.5 MGD  
cBOD5: 8 mg/l  
TKN: 6.8 mg/l  
D.O.: 1 mg/l  
Temperature: 20 Degrees C

**Geographic Information**

Segment Length: 1.8 miles  
Upstream Drainage Area: 12.14 Sq.Mi.  
Downstream Drainage Area: 0 Sq.Mi.  
Upstream Elevation: 1900 Ft.  
Downstream Elevation: 1800 Ft.

**Hydraulic Information**

Segment Width: 10.001 Ft.  
Segment Depth: 0.455 Ft.  
Segment Velocity: 0.773 Ft./Sec.  
Segment Flow: 2.272 MGD  
Incremental Flow: -1.772 MGD (Applied at end of segment.)

**Channel Information**

Cross Section: Rectangular  
Character: Mostly Straight  
Pool and Riffle: Yes  
Percent Pools: 50  
Percent Riffles: 50  
Pool Depth: 0.5 Ft.  
Riffle Depth: 0.4 Ft.  
Bottom Type: Small Rock  
Sludge: None  
Plants: None  
Algae: None

Calculation of Total Ammonia Nitrogen Limits

Facility Name: Western Washington County Water Reclamation Facility  
 VPDES Permit No: VA 0092860  
 Stream Name: Beaver Creek  
 Stream Tier Designation: I

NH<sub>3</sub>-N limits are derived from the ammonia tables or formulas in the Water Quality Standards. Human Health standards are not applicable for ammonia.

The following stream parameter values are being used for the calculations. The dry season is June - November and the wet season is December - May.

$$\begin{array}{l} \text{Dry Season pH} = \underline{8.55} \\ \text{Wet Season pH} = \underline{8.55} \end{array}$$

$$\begin{array}{l} \text{Dry Season Temperature (deg.C)} = \underline{20} \\ \text{Wet Season Temperature (deg.C)} = \underline{14} \end{array}$$

The ammonia nitrogen water quality standards (WQS) are:

$$\text{Acute: } AC_{\text{dry}} = \underline{1.96}$$

$$AC_{\text{wet}} = \underline{1.96}$$

$$\text{Chronic: } CC_{\text{dry}} = \underline{0.71}$$

$$CC_{\text{wet}} = \underline{1.00}$$

The following flows apply:

$$\begin{array}{ll} Q_e = \text{Design Flow of STP (MGD)} & = \underline{1.0} \\ Q_{s-1} = 1Q10 \text{ Flow (MGD)} & = \underline{1.70} \\ Q_{s-1w} = 1Q10 \text{ High Flow (MGD)} & = \underline{1.77} \\ Q_{s-30} = 30Q10 \text{ Flow (MGD)} & = \underline{2.00} \\ Q_{s-30w} = 30Q10 \text{ High Flow (MGD)} & = \underline{2.18} \end{array}$$

The water quality wasteload allocations (WLAs) are calculated as follows:

f = fraction of stream flow to use from MIX Program

Acute:

$$\begin{aligned} \text{Dry WLA}_a &= [AC_{\text{dry}}((f)Q_{s-1} + Q_e) - (f)(Q_{s-1})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Dry WLA}_a &= [1.96(( ) 1.70 + 1.0) - ( )( ) ( )] / (1.0) \text{ mg/l} \\ \text{Dry WLA}_a &= 5.29 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_a &= [AC_{\text{wet}}((f)Q_{s-1w} + Q_e) - (f)(Q_{s-1w})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Wet WLA}_a &= [1.96(( ) 1.77 + 1.0) - ( )( ) ( )] / (1.0) \text{ mg/l} \\ \text{Wet WLA}_a &= 5.42 \text{ mg/l} \end{aligned}$$

Chronic:

$$\begin{aligned} \text{Dry WLA}_c &= [CC_{\text{dry}}((f)Q_{s-30} + Q_e) - (f)(Q_{s-30})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Dry WLA}_c &= [0.70(( ) 2.00 + 1.0) - ( )( ) ( )] / (1.0) \text{ mg/l} \\ \text{Dry WLA}_c &= 2.10 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_c &= [CC_{\text{wet}}((f)Q_{s-30w} + Q_e) - (f)(Q_{s-30w})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Wet WLA}_c &= [1.00(( ) 2.18 + 1.0) - ( )( ) ( )] / (1.0) \text{ mg/l} \\ \text{Wet WLA}_c &= 3.18 \text{ mg/l} \end{aligned}$$

6/8/2015 9:48:14 AM

Facility = Western Washington County Water Reclamation Facility, 1.0 MGD Facility, Dry Season  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAA = 5.29  
WLAC = 2.1  
Q.L. = 0.2  
# samples/mo. = 20  
# samples/wk. = 5

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 4.23710719617425  
Average Weekly limit = 2.76156986677406  $\approx$  2.8 mg/l  
Average Monthly Limit = 2.18063471005079  $\approx$  2.2 mg/l

The data are:

6/8/2015 9:50:34 AM

Facility = Western Washington County Water Reclamation Facility. 1.0 MGD, Wet Season  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAa = 5.42  
WLAc = 3.18  
Q.L. = 0.2  
# samples/mo. = 20  
# samples/wk. = 5

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity

Maximum Daily Limit = 5.42  
Average Weekly limit = 3.53253009303846 ≈ 3.5 mg/l  
Average Monthly LImit = 2.78941258298748 ≈ 2.8 mg/l

The data are:

modout.txt  
"Model Run For C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.mod On  
6/25/2015 1:50:44 PM"

"Model is for BEAVER CREEK LAKE."  
"Model starts at the WASHINGTON COUNTY SERVICE AUTHORITY WWTP discharge."

"Background Data"  
"7Q10", "cBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.7723, 2, 0, 7.643, 20

"Discharge/Tributary Input Data for Segment 1"  
"Flow", "cBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1, 25, 5.2, 6.5, 20  
~~30 BOD<sub>5</sub>, NH<sub>3-N</sub>=2.2 mg/l~~

"Hydraulic Information for Segment 1"  
"Length", "width", "Depth", "Velocity"  
"(mi)", "(ft)", "(ft)", "(ft/sec)"  
1.8, 10.001, .515, .834

"Initial Mix Values for Segment 1"  
"Flow", "DO", "cBOD", "nBOD", "DOSat", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
2.7723, 7.23, 25.741, 3.436, 8.508, 20

"Rate Constants for Segment 1. - (All units Per Day)"  
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"  
.7, .7, 20, 20, .15, .15, 0, 0

"Output for Segment 1"  
"Segment starts at WASHINGTON COUNTY SERVICE AUTHORITY WWTP"  
"Total", "Segm."  
"Dist.", "Dist.", "DO", "cBOD", "nBOD"  
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"  
0, 0, 7.23, 25.741, 3.436  
.1, .1, 7.278, 25.609, 3.432  
.2, .2, 7.32, 25.478, 3.428  
.3, .3, 7.357, 25.348, 3.424  
.4, .4, 7.39, 25.218, 3.42  
.5, .5, 7.419, 25.089, 3.416  
.6, .6, 7.445, 24.961, 3.412  
.7, .7, 7.468, 24.833, 3.408  
.8, .8, 7.488, 24.706, 3.404  
.9, .9, 7.506, 24.58, 3.4  
1, 1, 7.522, 24.454, 3.396  
1.1, 1.1, 7.537, 24.329, 3.392  
1.2, 1.2, 7.55, 24.205, 3.388  
1.3, 1.3, 7.562, 24.081, 3.384  
1.4, 1.4, 7.573, 23.958, 3.38  
1.5, 1.5, 7.583, 23.835, 3.376  
1.6, 1.6, 7.592, 23.713, 3.372  
1.7, 1.7, 7.601, 23.592, 3.368  
1.8, 1.8, 7.609, 23.471, 3.364

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0  
Model Input File for the Discharge  
to BEAVER CREEK LAKE.

**File Information**

File Name: C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.  
Date Modified: June 25, 2015

**Water Quality Standards Information**

Stream Name: BEAVER CREEK LAKE  
River Basin: Tennessee/Big Sandy Rivers Basin  
Section: 4  
Class: V - Stockable Trout Waters  
Special Standards: None

**Background Flow Information**

Gauge Used: Beaver Creek Near Wallace  
Gauge Drainage Area: 13.7 Sq.Mi.  
Gauge 7Q10 Flow: 2 MGD  
Headwater Drainage Area: 12.14 Sq.Mi.  
Headwater 7Q10 Flow: 1.772263 MGD (Net; includes Withdrawals/Discharges)  
Withdrawal/Discharges: 0 MGD  
Incremental Flow in Segments: 0.1459854 MGD/Sq.Mi.

**Background Water Quality**

Background Temperature: 20 Degrees C  
Background cBOD5: 2 mg/l  
Background TKN: 0 mg/l  
Background D.O.: 7.642516 mg/l

**Model Segmentation**

Number of Segments: 1  
Model Start Elevation: 1900 ft above MSL  
Model End Elevation: 1800 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0  
Model Input File for the Discharge  
to BEAVER CREEK LAKE.

**Segment Information for Segment 1**

**Definition Information**

Segment Definition: A discharge enters.  
Discharge Name: WASHINGTON COUNTY SERVICE AUTHORITY WWTP  
VPDES Permit No.:

**Discharger Flow Information**

Flow: 1 MGD  
cBOD5: 25 mg/l  
TKN: 5.2 mg/l  
D.O.: 6.5 mg/l  
Temperature: 20 Degrees C

**Geographic Information**

Segment Length: 1.8 miles  
Upstream Drainage Area: 12.14 Sq.Mi.  
Downstream Drainage Area: 0 Sq.Mi.  
Upstream Elevation: 1900 Ft.  
Downstream Elevation: 1800 Ft.

**Hydraulic Information**

Segment Width: 10.001 Ft.  
Segment Depth: 0.515 Ft.  
Segment Velocity: 0.834 Ft./Sec.  
Segment Flow: 2.772 MGD  
Incremental Flow: -1.772 MGD (Applied at end of segment.)

**Channel Information**

Cross Section: Rectangular  
Character: Mostly Straight  
Pool and Riffle: Yes  
Percent Pools: 50  
Percent Riffles: 50  
Pool Depth: 0.6 Ft.  
Riffle Depth: 0.5 Ft.  
Bottom Type: Small Rock  
Sludge: None  
Plants: None  
Algae: None

modout.txt  
"Model Run For C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.mod On  
8/27/2015 2:20:18 PM"

"Model is for BEAVER CREEK LAKE."  
"Model starts at the WASHINGTON COUNTY SERVICE AUTHORITY WWTP discharge."

"Background Data"  
"7Q10", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.7723, 2, 0, 7.643, 20

"Discharge/Tributary Input Data for Segment 1"  
"Flow", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1, 8, 5.2, .3, 20  
~~2.2 N H<sub>2</sub>O~~

"Hydraulic Information for Segment 1"  
"Length", "width", "Depth", "Velocity"  
"(mi)", "(ft)", "(ft)", "(ft/sec)"  
1.8, 10.001, .514, .834

"Initial Mix Values for Segment 1"  
"Flow", "DO", "CBOD", "nBOD", "DOSat", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
2.7723, 5.968, 10.411, 3.436, 8.508, 20

"Rate Constants for Segment 1. - (All units Per Day)"  
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"  
.5, .5, 20, 20, .15, .15, 0, 0

"Output for Segment 1"  
"Segment starts at WASHINGTON COUNTY SERVICE AUTHORITY WWTP"

"Total", "Segm."  
"Dist.", "Dist.", "DO", "CBOD", "nBOD"  
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"  
0, 0, 5.968, 10.411, 3.436  
.1, .1, 6.275, 10.373, 3.432  
.2, .2, 6.541, 10.335, 3.428  
.3, .3, 6.77, 10.297, 3.424  
.4, .4, 6.968, 10.259, 3.42  
.5, .5, 7.139, 10.221, 3.416  
.6, .6, 7.287, 10.184, 3.412  
.7, .7, 7.415, 10.147, 3.408  
.8, .8, 7.526, 10.11, 3.404  
.9, .9, 7.622, 10.073, 3.4  
1, 1, 7.657, 10.036, 3.396  
1.1, 1.1, 7.657, 9.999, 3.392  
1.2, 1.2, 7.657, 9.962, 3.388  
1.3, 1.3, 7.657, 9.926, 3.384  
1.4, 1.4, 7.657, 9.89, 3.38  
1.5, 1.5, 7.657, 9.854, 3.376  
1.6, 1.6, 7.657, 9.818, 3.372  
1.7, 1.7, 7.657, 9.782, 3.368  
1.8, 1.8, 7.657, 9.746, 3.364

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0  
**Model Input File for the Discharge  
to BEAVER CREEK LAKE.**

**File Information**

File Name: C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.  
Date Modified: August 27, 2015

**Water Quality Standards Information**

Stream Name: BEAVER CREEK LAKE  
River Basin: Tennessee/Big Sandy Rivers Basin  
Section: 4  
Class: V - Stockable Trout Waters  
Special Standards: None

**Background Flow Information**

Gauge Used: Beaver Creek Near Wallace  
Gauge Drainage Area: 13.7 Sq.Mi.  
Gauge 7Q10 Flow: 2 MGD  
Headwater Drainage Area: 12.14 Sq.Mi.  
Headwater 7Q10 Flow: 1.772263 MGD (Net; includes Withdrawals/Discharges)  
Withdrawal/Discharges: 0 MGD  
Incremental Flow in Segments: 0.1459854 MGD/Sq.Mi.

**Background Water Quality**

Background Temperature: 20 Degrees C  
Background cBOD5: 2 mg/l  
Background TKN: 0 mg/l  
Background D.O.: 7.642516 mg/l

**Model Segmentation**

Number of Segments: 1  
Model Start Elevation: 1900 ft above MSL  
Model End Elevation: 1800 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0  
Model Input File for the Discharge  
to BEAVER CREEK LAKE.

Segment Information for Segment 1

Definition Information

Segment Definition: A discharge enters.  
Discharge Name: WASHINGTON COUNTY SERVICE AUTHORITY WWTP  
VPDES Permit No.:

Discharger Flow Information

Flow: 1 MGD  
cBOD5: 8 mg/l  
TKN: 5.2 mg/l  
D.O.: 3 mg/l  
Temperature: 20 Degrees C

Geographic Information

Segment Length: 1.8 miles  
Upstream Drainage Area: 0 Sq.Mi.  
Downstream Drainage Area: 1 Sq.Mi.  
Upstream Elevation: 1900 Ft.  
Downstream Elevation: 1800 Ft.

Hydraulic Information

Segment Width: 10.001 Ft.  
Segment Depth: 0.514 Ft.  
Segment Velocity: 0.834 Ft./Sec.  
Segment Flow: 2.772 MGD  
Incremental Flow: -1.772 MGD (Applied at end of segment.)

Channel Information

Cross Section: Rectangular  
Character: Mostly Straight  
Pool and Riffle:  
Percent Pools: 50  
Percent Riffles: 50  
Pool Depth: 0.6 Ft.  
Riffle Depth: 0.5 Ft.  
Bottom Type: Small Rock  
Sludge: None  
Plants: None  
Algae: None

### Calculation of Total Ammonia Nitrogen Limits

Facility Name: Western Washington County Water Reclamation Facility  
 VPDES Permit No: VA 00 Q2860  
 Stream Name: Beaver Creek  
 Stream Tier Designation: I

NH<sub>3</sub>-N limits are derived from the ammonia tables or formulas in the Water Quality Standards. Human Health standards are not applicable for ammonia.

The following stream parameter values are being used for the calculations. The dry season is June - November and the wet season is December - May.

$$\begin{array}{l} \text{Dry Season pH} = 8.55 \\ \text{Wet Season pH} = 8.55 \end{array}$$

$$\begin{array}{l} \text{Dry Season Temperature (deg.C)} = 20 \\ \text{Wet Season Temperature (deg.C)} = 14 \end{array}$$

The ammonia nitrogen water quality standards (WQS) are:

$$\text{Acute: } AC_{\text{dry}} = 1.96$$

$$AC_{\text{wet}} = 1.96$$

$$\text{Chronic: } CC_{\text{dry}} = 0.71$$

$$CC_{\text{wet}} = 1.00$$

The following flows apply:

$$\begin{array}{ll} Q_e = \text{Design Flow of STP (MGD)} & = 1.5 \\ Q_{s-1} = 1Q10 \text{ Flow (MGD)} & = 1.70 \\ Q_{s-1w} = 1Q10 \text{ High Flow (MGD)} & = 1.77 \\ Q_{s-30} = 30Q10 \text{ Flow (MGD)} & = 2.00 \\ Q_{s-30w} = 30Q10 \text{ High Flow (MGD)} & = 2.18 \end{array}$$

The water quality wasteload allocations (WLAs) are calculated as follows:

f = fraction of stream flow to use from MIX Program

Acute:

$$\begin{aligned} \text{Dry WLA}_a &= [AC_{\text{dry}}((f)Q_{s-1} + Q_e) - (f)(Q_{s-1})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Dry WLA}_a &= [1.96(( )1.70 + 1.5) - ( )( )(( ))] / (1.5) \text{ mg/l} \\ \text{Dry WLA}_a &= 4.18 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_a &= [AC_{\text{wet}}((f)Q_{s-1w} + Q_e) - (f)(Q_{s-1w})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Wet WLA}_a &= [1.96(( )1.77 + 1.5) - ( )( )(( ))] / (1.5) \text{ mg/l} \\ \text{Wet WLA}_a &= 4.27 \text{ mg/l} \end{aligned}$$

Chronic:

$$\begin{aligned} \text{Dry WLA}_c &= [CC_{\text{dry}}((f)Q_{s-30} + Q_e) - (f)(Q_{s-30})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Dry WLA}_c &= [0.70(( )2.00 + 1.5) - ( )( )(( ))] / (1.5) \text{ mg/l} \\ \text{Dry WLA}_c &= 1.63 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_c &= [CC_{\text{wet}}((f)Q_{s-30w} + Q_e) - (f)(Q_{s-30w})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Wet WLA}_c &= [1.00(( )2.18 + 1.5) - ( )( )(( ))] / (1.5) \text{ mg/l} \\ \text{Wet WLA}_c &= 2.45 \text{ mg/l} \end{aligned}$$

6/8/2015 9:56:14 AM

Facility = Western Washington County Water Reclamation Facility, 1.5 MGD Facility, Dry  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAa = 4.18  
WLAc = 1.63  
Q.L. = 0.2  
# samples/mo. = 20  
# samples/wk. = 5

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 3.28880225226859  
Average Weekly limit = 2.14350422992462  $\approx$  2.1 mg/l  
Average Monthly LImit = 1.6925878939918  $\approx$  1.7 mg/l

The data are:

6/8/2015 9:57:41 AM

Facility = Western Washington County Water Reclamation Facility, 1.5 MGD Facility, Wet  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAA = 4.27  
WLAC = 2.45  
Q.L. = 0.2  
# samples/mo. = 20  
# samples/wk. = 5

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity

Maximum Daily Limit = 4.27  
Average Weekly limit = 2.78300802532735  $\approx$  2.8 mg/l  
Average Monthly LImit = 2.19756304969678  $\approx$  2.2 mg/l

The data are:

modout.txt  
"Model Run For C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.mod On  
6/25/2015 1:36:50 PM"

"Model is for BEAVER CREEK LAKE."  
"Model starts at the WASHINGTON COUNTY SERVICE AUTHORITY WWTP discharge."

"Background Data"  
"7Q10", "cBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.7723, 2, 0, 7.643, 20

"Discharge/Tributary Input Data for Segment 1"  
"Flow", "cBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.5, 25, 4.7, 6.5, 20

*30 BODs N<sub>H3-N</sub> = 1.7 mg/l*

"Hydraulic Information for Segment 1"  
"Length", "Width", "Depth", "Velocity"  
"(mi)", "(ft)", "(ft)", "(ft/sec)"  
1.8, 10, .571, .887

"Initial Mix Values for Segment 1"  
"Flow", "DO", "cBOD", "nBOD", "dosat", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
3.2723, 7.119, 31.358, 3.374, 8.508, 20

"Rate Constants for Segment 1. - (All units Per Day)"  
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"  
.7, .7, 20, 20, .15, .15, 0, 0

"Output for Segment 1"  
"Segment starts at WASHINGTON COUNTY SERVICE AUTHORITY WWTP"

"Total", "Segm."  
"Dist.", "Dist.", "DO", "cBOD", "nBOD"  
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"  
0, 0, 7.119, 31.358, 3.374  
.1, .1, 7.154, 31.207, 3.371  
.2, .2, 7.185, 31.057, 3.368  
.3, .3, 7.212, 30.908, 3.365  
.4, .4, 7.237, 30.759, 3.362  
.5, .5, 7.259, 30.611, 3.359  
.6, .6, 7.279, 30.464, 3.356  
.7, .7, 7.297, 30.317, 3.353  
.8, .8, 7.313, 30.171, 3.35  
.9, .9, 7.328, 30.026, 3.347  
1, 1, 7.342, 29.882, 3.344  
1.1, 1.1, 7.355, 29.738, 3.341  
1.2, 1.2, 7.366, 29.595, 3.338  
1.3, 1.3, 7.377, 29.453, 3.335  
1.4, 1.4, 7.387, 29.311, 3.332  
1.5, 1.5, 7.396, 29.17, 3.329  
1.6, 1.6, 7.405, 29.03, 3.326  
1.7, 1.7, 7.413, 28.89, 3.323  
1.8, 1.8, 7.421, 28.751, 3.32

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0  
**Model Input File for the Discharge  
to BEAVER CREEK LAKE.**

**File Information**

File Name: C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.  
Date Modified: June 25, 2015

**Water Quality Standards Information**

Stream Name: BEAVER CREEK LAKE  
River Basin: Tennessee/Big Sandy Rivers Basin  
Section: 4  
Class: V - Stockable Trout Waters  
Special Standards: None

**Background Flow Information**

Gauge Used: Beaver Creek Near Wallace  
Gauge Drainage Area: 13.7 Sq.Mi.  
Gauge 7Q10 Flow: 2 MGD  
Headwater Drainage Area: 12.14 Sq.Mi.  
Headwater 7Q10 Flow: 1.772263 MGD (Net; includes Withdrawals/Discharges)  
Withdrawal/Discharges: 0 MGD  
Incremental Flow in Segments: 0.1459854 MGD/Sq.Mi.

**Background Water Quality**

Background Temperature: 20 Degrees C  
Background cBOD5: 2 mg/l  
Background TKN: 0 mg/l  
Background D.O.: 7.642516 mg/l

**Model Segmentation**

Number of Segments: 1  
Model Start Elevation: 1900 ft above MSL  
Model End Elevation: 1800 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0  
Model Input File for the Discharge  
to BEAVER CREEK LAKE.

**Segment Information for Segment 1**

**Definition Information**

Segment Definition: A discharge enters.  
Discharge Name: WASHINGTON COUNTY SERVICE AUTHORITY WWTP  
VPDES Permit No.:

**Discharger Flow Information**

Flow: 1.5 MGD  
cBOD5: 25 mg/l  
TKN: 4.7 mg/l  
D.O.: 6.5 mg/l  
Temperature: 20 Degrees C

**Geographic Information**

Segment Length: 1.8 miles  
Upstream Drainage Area: 12.14 Sq.Mi.  
Downstream Drainage Area: 0 Sq.Mi.  
Upstream Elevation: 1900 Ft.  
Downstream Elevation: 1800 Ft.

**Hydraulic Information**

Segment Width: 10 Ft.  
Segment Depth: 0.571 Ft.  
Segment Velocity: 0.887 Ft./Sec.  
Segment Flow: 3.272 MGD  
Incremental Flow: -1.772 MGD (Applied at end of segment.)

**Channel Information**

Cross Section: Rectangular  
Character: Mostly Straight  
Pool and Riffle:  
    Percent Pools: 50  
    Percent Riffles: 50  
    Pool Depth: 0.6 Ft.  
    Riffle Depth: 0.5 Ft.  
Bottom Type: Small Rock  
Sludge: None  
Plants: None  
Algae: None

modout.txt  
"Model Run For C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.mod On  
8/27/2015 2:17:23 PM"

"Model is for BEAVER CREEK LAKE."

"Model starts at the WASHINGTON COUNTY SERVICE AUTHORITY WWTP discharge."

"Background Data"

"7Q10", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.7723, 2, 0, 7.643, 20

"Discharge/Tributary Input Data for Segment 1"

"Flow", "CBOD5", "TKN", "DO", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
1.5, 8, 4.7, 4, 20  
1.7 NH<sub>3</sub>-N

"Hydraulic Information for Segment 1"

"Length", "width", "Depth", "Velocity"  
"(mi)", "(ft)", "(ft)", "(ft/sec)"  
1.8, 10, .571, .887

"Initial Mix Values for Segment 1"

"Flow", "DO", "CBOD", "nBOD", "DOSat", "Temp"  
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"  
3.2723, 5.973, 11.876, 3.374, 8.508, 20

"Rate Constants for Segment 1. - (All units Per Day)"

"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"  
.5, .5, 20, 20, .15, .15, 0, 0

"Output for Segment 1"

"Segment starts at WASHINGTON COUNTY SERVICE AUTHORITY WWTP"

"Total", "Segm."

"Dist.", "Dist.", "DO", "cBOD", "nBOD"  
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"  
0, 0, 5.973, 11.876, 3.374  
.1, .1, 6.258, 11.835, 3.371  
.2, .2, 6.506, 11.794, 3.368  
.3, .3, 6.723, 11.753, 3.365  
.4, .4, 6.912, 11.713, 3.362  
.5, .5, 7.077, 11.673, 3.359  
.6, .6, 7.22, 11.633, 3.356  
.7, .7, 7.345, 11.593, 3.353  
.8, .8, 7.454, 11.553, 3.35  
.9, .9, 7.549, 11.513, 3.347  
1, 1, 7.632, 11.473, 3.344  
1.1, 1.1, 7.657, 11.434, 3.341  
1.2, 1.2, 7.657, 11.395, 3.338  
1.3, 1.3, 7.657, 11.356, 3.335  
1.4, 1.4, 7.657, 11.317, 3.332  
1.5, 1.5, 7.657, 11.278, 3.329  
1.6, 1.6, 7.657, 11.239, 3.326  
1.7, 1.7, 7.657, 11.2, 3.323  
1.8, 1.8, 7.657, 11.161, 3.32

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0  
**Model Input File for the Discharge  
to BEAVER CREEK LAKE.**

**File Information**

File Name: C:\Users\jjc93887\Documents\FREDWORK\Western Wash. Co. WWTP.  
Date Modified: August 27, 2015

**Water Quality Standards Information**

Stream Name: BEAVER CREEK LAKE  
River Basin: Tennessee/Big Sandy Rivers Basin  
Section: 4  
Class: V - Stockable Trout Waters  
Special Standards: None

**Background Flow Information**

Gauge Used: Beaver Creek Near Wallace  
Gauge Drainage Area: 13.7 Sq.Mi.  
Gauge 7Q10 Flow: 2 MGD  
Headwater Drainage Area: 12.14 Sq.Mi.  
Headwater 7Q10 Flow: 1.772263 MGD (Net; includes Withdrawals/Discharges)  
Withdrawal/Discharges: 0 MGD  
Incremental Flow in Segments: 0.1459854 MGD/Sq.Mi.

**Background Water Quality**

Background Temperature: 20 Degrees C  
Background cBOD5: 2 mg/l  
Background TKN: 0 mg/l  
Background D.O.: 7.642516 mg/l

**Model Segmentation**

Number of Segments: 1  
Model Start Elevation: 1900 ft above MSL  
Model End Elevation: 1800 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0  
Model Input File for the Discharge  
to BEAVER CREEK LAKE.

**Segment Information for Segment 1**

**Definition Information**

Segment Definition: A discharge enters.  
Discharge Name: WASHINGTON COUNTY SERVICE AUTHORITY WWTP  
VPDES Permit No.:

**Discharger Flow Information**

Flow: 1.5 MGD  
cBOD5: 8 mg/l  
TKN: 4.7 mg/l  
D.O.: 4 mg/l  
Temperature: 20 Degrees C

**Geographic Information**

Segment Length: 1.8 miles  
Upstream Drainage Area: 0 Sq.Mi.  
Downstream Drainage Area: 1 Sq.Mi.  
Upstream Elevation: 1900 Ft.  
Downstream Elevation: 1800 Ft.

**Hydraulic Information**

Segment Width: 10 Ft.  
Segment Depth: 0.571 Ft.  
Segment Velocity: 0.887 Ft./Sec.  
Segment Flow: 3.272 MGD  
Incremental Flow: -1.772 MGD (Applied at end of segment.)

**Channel Information**

Cross Section: Rectangular  
Character: Mostly Straight  
Pool and Riffle:  
    Percent Pools: 50  
    Percent Riffles: 50  
    Pool Depth: 0.6 Ft.  
    Riffle Depth: 0.5 Ft.  
Bottom Type: Small Rock  
Sludge: None  
Plants: None  
Algae: None

Calculation of Total Ammonia Nitrogen Limits

Facility Name: Western Washington County Water Reclamation Facility  
 VPDES Permit No: VA 00 92860  
 Stream Name: Beaver Creek  
 Stream Tier Designation: I

Proposed EPA Criteria

NH<sub>3</sub>-N limits are derived from the ammonia tables or formulas in the Water Quality Standards. Human Health standards are not applicable for ammonia.

The following stream parameter values are being used for the calculations. The dry season is June - November and the wet season is December - May.

$$\begin{array}{l} \text{Dry Season pH} = \underline{8.55} \\ \text{Wet Season pH} = \underline{8.55} \end{array}$$

$$\begin{array}{l} \text{Dry Season Temperature (deg.C)} = \underline{20} \\ \text{Wet Season Temperature (deg.C)} = \underline{14} \end{array}$$

The ammonia nitrogen water quality standards (WQS) are:

$$\text{Acute: } AC_{\text{dry}} = \underline{1.4}$$

$$AC_{\text{wet}} = \underline{2.0}$$

$$\text{Chronic: } CC_{\text{dry}} = \underline{0.32}$$

$$CC_{\text{wet}} = \underline{0.41}$$

The following flows apply:

$$\begin{array}{ll} Q_e = \text{Design Flow of STP (MGD)} & = \underline{0.5} \\ Q_{s-1} = 1Q10 \text{ Flow (MGD)} & = \underline{1.10} \\ Q_{s-1w} = 1Q10 \text{ High Flow (MGD)} & = \underline{1.77} \\ Q_{s-30} = 30Q10 \text{ Flow (MGD)} & = \underline{2.00} \\ Q_{s-30w} = 30Q10 \text{ High Flow (MGD)} & = \underline{2.18} \end{array}$$

The water quality wasteload allocations (WLAs) are calculated as follows:

$f$  = fraction of stream flow to use from MIX Program

Acute:

$$\begin{aligned} \text{Dry WLA}_a &= [AC_{\text{dry}}((f)Q_{s-1} + Q_e) - (f)(Q_{s-1})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Dry WLA}_a &= [1.4((f)(1.10 + 0.5)) - (f)(1.10)(\text{NH}_3\text{-N background})] / (0.5) \text{ mg/l} \\ \text{Dry WLA}_a &= \underline{6.2 \text{ mg/l}} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_a &= [AC_{\text{wet}}((f)Q_{s-1w} + Q_e) - (f)(Q_{s-1w})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Wet WLA}_a &= [2.0((f)(1.77 + 0.5)) - (f)(1.77)(\text{NH}_3\text{-N background})] / (0.5) \text{ mg/l} \\ \text{Wet WLA}_a &= \underline{9.1 \text{ mg/l}} \end{aligned}$$

Chronic:

$$\begin{aligned} \text{Dry WLA}_c &= [CC_{\text{dry}}((f)Q_{s-30} + Q_e) - (f)(Q_{s-30})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Dry WLA}_c &= [0.32((f)(2.00 + 0.5)) - (f)(2.00)(\text{NH}_3\text{-N background})] / (0.5) \text{ mg/l} \\ \text{Dry WLA}_c &= \underline{1.6 \text{ mg/l}} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_c &= [CC_{\text{wet}}((f)Q_{s-30w} + Q_e) - (f)(Q_{s-30w})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Wet WLA}_c &= [0.41((f)(2.18 + 0.5)) - (f)(2.18)(\text{NH}_3\text{-N background})] / (0.5) \text{ mg/l} \\ \text{Wet WLA}_c &= \underline{2.51 \text{ mg/l}} \end{aligned}$$

6/8/2015 10:22:35 AM

Facility = Western Washington County Water Reclamation Facility, 0.5 MGD, Dry Season, EPA Crit  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAa = 6.2  
WLAc = 1.6  
Q.L. = 0.2  
# samples/mo. = 12  
# samples/wk. = 3

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 3.2282721494661  
Average Weekly limit = 2.36129932535956       $\approx 2.4 \text{ mg/l}$   
Average Monthly LImit = 1.75885936464567       $\approx 1.8 \text{ mg/l}$

The data are:

Calculation of Total Ammonia Nitrogen Limits

Facility Name: Western Washington County Water Reclamation Facility  
 VPDES Permit No: VA 00 Q2860  
 Stream Name: Beaver Creek  
 Stream Tier Designation: I

Proposed EPA Criteria

$\text{NH}_3\text{-N}$  limits are derived from the ammonia tables or formulas in the Water Quality Standards. Human Health standards are not applicable for ammonia.

The following stream parameter values are being used for the calculations. The dry season is June - November and the wet season is December - May.

$$\begin{array}{l} \text{Dry Season pH} = 8.55 \\ \text{Wet Season pH} = 8.55 \end{array}$$

$$\begin{array}{l} \text{Dry Season Temperature (deg.C)} = 20 \\ \text{Wet Season Temperature (deg.C)} = 14 \end{array}$$

The ammonia nitrogen water quality standards (WQS) are:

$$\text{Acute: } AC_{\text{dry}} = 1.4$$

$$AC_{\text{wet}} = 2.0$$

$$\text{Chronic: } CC_{\text{dry}} = 0.32$$

$$CC_{\text{wet}} = 0.41$$

The following flows apply:

$$\begin{array}{ll} Q_e = \text{Design Flow of STP (MGD)} & 1.0 \\ Q_{s-1} = 1Q10 \text{ Flow (MGD)} & 1.70 \\ Q_{s-1w} = 1Q10 \text{ High Flow (MGD)} & 1.77 \\ Q_{s-30} = 30Q10 \text{ Flow (MGD)} & 2.00 \\ Q_{s-30w} = 30Q10 \text{ High Flow (MGD)} & 2.18 \end{array}$$

The water quality wasteload allocations (WLAs) are calculated as follows:

$f$  = fraction of stream flow to use from MIX Program

Acute:

$$\begin{aligned} \text{Dry WLA}_a &= [AC_{\text{dry}}((f)Q_{s-1} + Q_e) - (f)(Q_{s-1})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Dry WLA}_a &= [1.4((f)1.70 + 1.0) - (f)(1.70)(\text{NH}_3\text{-N background})] / (1.0) \text{ mg/l} \\ \text{Dry WLA}_a &= 3.8 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_a &= [AC_{\text{wet}}((f)Q_{s-1w} + Q_e) - (f)(Q_{s-1w})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l} \\ \text{Wet WLA}_a &= [2.0((f)1.77 + 1.0) - (f)(1.77)(\text{NH}_3\text{-N background})] / (1.0) \text{ mg/l} \\ \text{Wet WLA}_a &= 5.5 \text{ mg/l} \end{aligned}$$

Chronic:

$$\begin{aligned} \text{Dry WLA}_c &= [CC_{\text{dry}}((f)Q_{s-30} + Q_e) - (f)(Q_{s-30})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Dry WLA}_c &= [0.32((f)2.00 + 1.0) - (f)(2.00)(\text{NH}_3\text{-N background})] / (1.0) \text{ mg/l} \\ \text{Dry WLA}_c &= 0.96 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{Wet WLA}_c &= [CC_{\text{wet}}((f)Q_{s-30w} + Q_e) - (f)(Q_{s-30w})(\text{NH}_3\text{-N background})] / (Q_e) \\ \text{Wet WLA}_c &= [0.41((f)2.18 + 1.0) - (f)(2.18)(\text{NH}_3\text{-N background})] / (1.0) \text{ mg/l} \\ \text{Wet WLA}_c &= 1.49 \text{ mg/l} \end{aligned}$$

6/8/2015 10:57:09 AM

Facility = Western Washington County Water Reclamation Facility, 1.0 MGD, Dry Season, EPA Crit  
Chemical = Ammonia Nitrogen  
Chronic averaging period = 30  
WLAa = 3.8  
WLAc = 0.96  
Q.L. = 0.2  
# samples/mo. = 20  
# samples/wk. = 5

Summary of Statistics:

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average= 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 1.93696328967966  
Average Weekly limit = 1.26243193909671  $\approx$  1.3 mg/l  
Average Monthly LImit = 0.996861581737502  $\approx$  1.0 mg/l

The data are:

Calculation of Total Ammonia Nitrogen Limits

Facility Name: Western Washington County Water Reclamation Facility  
 VPDES Permit No: VA 00 92860  
 Stream Name: Beaver Creek  
 Stream Tier Designation: I

Proposed EPA Criteria

NH<sub>3</sub>-N limits are derived from the ammonia tables or formulas in the Water Quality Standards. Human Health standards are not applicable for ammonia.

The following stream parameter values are being used for the calculations. The dry season is June - November and the wet season is December - May.

$$\text{Dry Season pH} = \underline{\underline{8.55}}$$

$$\text{Wet Season pH} = \underline{\underline{8.55}}$$

$$\text{Dry Season Temperature (deg.C)} = \underline{\underline{20}}$$

$$\text{Wet Season Temperature (deg.C)} = \underline{\underline{14}}$$

The ammonia nitrogen water quality standards (WQS) are:

$$\text{Acute: } AC_{\text{dry}} = \underline{\underline{1.4}}$$

$$AC_{\text{wet}} = \underline{\underline{2.0}}$$

$$\text{Chronic: } CC_{\text{dry}} = \underline{\underline{0.32}}$$

$$CC_{\text{wet}} = \underline{\underline{0.47}}$$

The following flows apply:

$$Q_e = \text{Design Flow of STP (MGD)} = \underline{\underline{1.5}}$$

$$Q_{s-1} = 1Q10 \text{ Flow (MGD)} = \underline{\underline{1.10}}$$

$$Q_{s-1w} = 1Q10 \text{ High Flow (MGD)} = \underline{\underline{1.77}}$$

$$Q_{s-30} = 30Q10 \text{ Flow (MGD)} = \underline{\underline{2.00}}$$

$$Q_{s-30w} = 30Q10 \text{ High Flow (MGD)} = \underline{\underline{2.18}}$$

The water quality wasteload allocations (WLAs) are calculated as follows:

$f$  = fraction of stream flow to use from MIX Program

Acute:

$$\text{Dry WLA}_a = [AC_{\text{dry}}((f)Q_{s-1} + Q_e) - (f)(Q_{s-1})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l}$$

$$\text{Dry WLA}_a = [1.4((f)(1.77 + 1.5) - (f)(1.10))] / (1.5) \text{ mg/l}$$

$$\text{Dry WLA}_a = 3.0 \text{ mg/l}$$

$$\text{Wet WLA}_a = [AC_{\text{wet}}((f)Q_{s-1w} + Q_e) - (f)(Q_{s-1w})(\text{NH}_3\text{-N background})] / (Q_e) \text{ mg/l}$$

$$\text{Wet WLA}_a = [2.0((f)(2.18 + 1.5) - (f)(1.77))] / (1.5) \text{ mg/l}$$

$$\text{Wet WLA}_a = 4.9 \text{ mg/l}$$

Chronic:

$$\text{Dry WLA}_c = [CC_{\text{dry}}((f)Q_{s-30} + Q_e) - (f)(Q_{s-30})(\text{NH}_3\text{-N background})] / (Q_e)$$

$$\text{Dry WLA}_c = [0.32((f)(2.00 + 1.5) - (f)(1.10))] / (1.5) \text{ mg/l}$$

$$\text{Dry WLA}_c = 0.75 \text{ mg/l}$$

$$\text{Wet WLA}_c = [CC_{\text{wet}}((f)Q_{s-30w} + Q_e) - (f)(Q_{s-30w})(\text{NH}_3\text{-N background})] / (Q_e)$$

$$\text{Wet WLA}_c = [0.47((f)(2.18 + 1.5) - (f)(2.18))] / (1.5) \text{ mg/l}$$

$$\text{Wet WLA}_c = 1.15 \text{ mg/l}$$

6/25/2015 2:41:37 PM

Facility = Western Washington Co. Dry EPA Criteria, 1.5 MGD

Chemical = Ammonia Nitrogen

Chronic averaging period = 30

WLAA = 3

WLAC = 0.75

Q.L. = 0.2

# samples/mo. = 20

# samples/wk. = 5

Summary of Statistics:

# observations = 1

Expected Value = 9

Variance = 29.16

C.V. = 0.6

97th percentile daily values = 21.9007

97th percentile 4 day average = 14.9741

97th percentile 30 day average= 10.8544

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 1.51325257006223

Average Weekly limit = 0.986274952419306  $\approx$  1.0 mg/l

Average Monthly Limit = 0.778798110732423  $\approx$  0.8 mg/l

The data are:

ATTACHMENT 4  
Whole Effluent Toxicity Analysis

## Spreadsheet for determination of WET test endpoints or WET limits

**Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)**

If you have at least 10 data points that are quantifiable (not “-” or ‘>’), enter the data in either for a species, enter the data in either column “G” (vertebrate) or column “J” (invertebrate). The CV will be picked up for the calculations below. The default values for ea. eB and eC will change if the CV is anything other than 0.6.

### Coefficient of Variation for affluent tests

|              |             |               |
|--------------|-------------|---------------|
| CV =         | 0.6         | (Default 0.6) |
| $\sigma^2 =$ | 0.3074847   |               |
| $\sigma =$   | 0.554513039 |               |

Using the log variance to develop a  
(P-100, step 2a of TSD)  
 $Z = 1.881$  (97% probability stat from table  
A = -0.88929668

| Step   | Equation    | Value | Comments |
|--|-------------|-------|----------|
| Using the log variance to develop eB<br>(P-variance, step 2b of TSD) |             |       |          |
| $\sigma_e^2 =$   | 0.086177696 |       |          |
| $\Delta_e =$   | 0.29560379  |       |          |
| $B_e =$  | -0.59050823 |       |          |
| $eB_e =$   | 0.60103335  |       |          |
| Using the log variance to develop eC                                 |             |       |          |

Using the log variance to develop end (P. 100, step do of TSD) n = 1 This number will most likely be 1

|         |             |
|---------|-------------|
| $b_0 =$ | 0.554513029 |
| $D =$   | 0.889286658 |
| $eD =$  | 2.433417525 |



Cell: I19

Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18

Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22

Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40

Comment: If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41

Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48

Comment: See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62

Comment: Vertebrates are:

Pimephales promelas  
Oncomyces mykiss  
Cyprinodon variegatus

Cell: J62

Comment: Invertebrates are:

Ceriodaphnia dubia  
Mysidopsis bahia

Cell: C117

Comment: Vertebrates are:

Pimephales promelas  
Cyprinodon variegatus

Cell: M119

Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121

Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same:  $100/\text{NOEC} = \text{TUc}$  or  $100/\text{LC50} = \text{TUa}$ .

Cell: C138

Comment: invertebrates are:

Ceriodaphnia dubia  
Mysidopsis bahia

## Spreadsheet for determination of WET test endpoints or WET limits



Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results. To calculate ACR, divide the NOEC<sub>acute</sub> by the NOEC<sub>chronic</sub>. The chronic NOEC must be less than the acute NOEC, since the ACR divides the LC<sub>50</sub> by the NOEC. LC<sub>50</sub>s >100% should not be used.

**Table 1.** ACR using Vertebrate data

**Table 1. Result:**

#N/A #N/A #N/A

| DILUTION SERIES TO RECOMMEND       |                          |              |       |       |       |
|------------------------------------|--------------------------|--------------|-------|-------|-------|
|                                    | Monitoring<br>% Effluent | Limit<br>TUC |       |       |       |
| Dilution series based on data mean | 60. 1                    | 1.664873     |       |       |       |
| Dilution series to use for limit   |                          | 25           |       |       |       |
| Dilution factor to recommend:      | 0.7750138                | 0.5          |       |       |       |
| Dilution series to recommend:      | 100.0                    | 100.0        | 100.0 | 100.0 | 100.0 |
|                                    | 77.5                     | 1.29         | 50.0  | 2.00  |       |
|                                    | 60.1                     | 1.66         | 25.0  | 4.00  |       |
|                                    | 46.6                     | 2.15         | 12.5  | 8.00  |       |
|                                    | 36.08                    | 2.77         | 6.3   |       | 16.00 |
| Extra dilutions if needed          | 27.96                    | 3.58         | 3.1   | 32.00 |       |
|                                    | 21.67                    | 4.61         | 1.6   | 64.00 |       |
|                                    |                          |              |       |       |       |

Cell: I9

Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18

Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22

Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40

Comment: If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41

Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.5", make sure you have selected "Y" in cell E20

Cell: L48

Comment: See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G82

Comment: Vertebrates are:

Pimephales promelas

Oncorhynchus mykiss

Cyprinodon variegatus

Cell: J52

Comment: Invertebrates are:

Centropages dubia

Mysidopsis bahia

Cell: C117

Comment: Vertebrates are:

Pimephales promelas

Cyprinodon variegatus

Cell: M119

Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121

Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUs. The calculation is the same: 100/NOEC = TU or 100/LC50 = TU.

Cell: C138

Comment: Invertebrates are:

Centropages dubia

Mysidopsis bahia

## Spreadsheet for determination of WET test endpoints or WET limits

| Spreadsheet for determination of WET test endpoints or WET limits |                         |  |  |               |  |   |  |                  |   |
|---|-------------------------|--|--|---------------|--|---|--|------------------|---|
| Excel 97  | Revision Date: 12/13/13 | File: WETLM10.xls<br>(MIX.EXE required also) | Acute Endpoint/Permit Limit  |               |  |   |  |                  | Use as LC <sub>50</sub> in Special Condition, as TU <sub>a</sub> on DMR |
|   |                         |  | ACUTE  | 100% =        | NOAEC  | LC <sub>50</sub> = NA   | % Use as   | NA               | TU <sub>a</sub>   |
| 4   |                         |  | ACUTE WLA <sub>a</sub>   | 0.64          |  | Note: Inform the permittee that if the mean of the data exceeds this TU <sub>a</sub> , a limit may result using STATS.EXE | 1.0  |                  |   |
| 5   |                         |  | Chronic Endpoint/Permit Limit  |               |  | Use as NOEC in Special Condition, as TU <sub>c</sub> on DMR   |  |                  |   |
| 6   |                         |  | CHRONIC  | 3.18341281    | TU <sub>c</sub>  | NOEBC =   | 32 % Use as  | 3.12             | TU <sub>c</sub>   |
| 7   |                         |  | BCTH*  | 6.40000016    | TU <sub>c</sub>  | NOEBC =   | 6.25 % Use as  | 6.25             | TU <sub>c</sub>   |
| 8   |                         |  | AML  | 3.18341281    | TU <sub>c</sub>  | NOEBC =   | 32 % Use as  | 3.12             | TU <sub>c</sub>   |
| 9   |                         |  | ACUTE WLA <sub>a</sub> C   | 6.4           |  | Note: Inform the permittee that if the mean of the data exceeds this TU <sub>c</sub> , a limit may result using STATS.EXE | 1.31026125   |                  |   |
| 10  |                         |  | CHRONIC  | 2.18          |  |   |  |                  |   |
| 11  |                         |  | Facility Name: Western Washington Co   |               |  |   |  |                  |   |
| 12  |                         |  | VPDES Number: VA0092860  | 1             |  |   |  |                  |   |
| 13  |                         |  | Outfall Number:  |               |  |   |  |                  |   |
| 14  |                         |  | Plant Flow:  | 1.5 MGD       |  | Diffuser / modeling study?  | n  |                  |   |
| 15  |                         |  | Acute TO10:  | 1.7 MGD       | 100 %  | Enter Y/N   | Acute  | 1                |   |
| 16  |                         |  | Chronic TO10:  | 1.7 MGD       | 100 %  |   | Chronic  | 1                |   |
| 17  |                         |  | Are data available to calculate CV7? (Y/N)                                     | N             | (Minimum of 10 data points, same species, needed)                    |   |  |                  | Go to Page 2  |
| 18  |                         |  | Are data available to calculate ACR? (Y/N)                                     | N             | (NOEC-LC50, do not use greater/less than data)                       |   |  |                  | Go to Page 3  |
| 19  |                         |  | IWC <sub>a</sub>   | 48.875 %      | Plant flow/plant flow + 1Q10   | NOTE: If the IWC <sub>a</sub> is >33%, specify the NOAEC = 100% test endpoint for use                                     |  |                  |   |
| 20  |                         |  | IWC <sub>c</sub>   | 45.87155065 % | Plant flow/plant flow + 7Q10   |   |  |                  |   |
| 21  |                         |  | Dilution, acute  | 2.133333333   | 100/IWC <sub>a</sub>   |   |  |                  |   |
| 22  |                         |  | Dilution, chronic  | 2.18          | 100/IWC <sub>c</sub>   |   |  |                  |   |
| 23  |                         |  | W.L.A. <sub>a</sub>  | 0.64          | Instream criterion (0.3 TU <sub>a</sub> ) X's Dilution, acute        |   |  |                  |   |
| 24  |                         |  | W.L.A. <sub>c</sub>  | 0.7           | Instream criterion (1.0 TU <sub>c</sub> ) X's Dilution, chronic      |   |  |                  |   |
| 25  |                         |  | W.L.A.s  | 6.4           | ACR X's W.L.A. <sub>s</sub> - converts acute W.L.A. to chronic units |   |  |                  |   |
| 26  |                         |  | ACR  | 10            | LC50/NOEC (Default is 10 - if data are available, use tables Page 3) |   |  |                  |   |
| 27  |                         |  | CV-Coefficient of variation  | 0.6           | LC50/NOEC (Default is 10 - if data are available, use tables Page 2) |   |  |                  |   |
| 28  |                         |  | Constraints eA   | 0.4/0.94/47   | Default = 0.41   |   |  |                  |   |
| 29  |                         |  | eB   | 0.6/0.0573    | Default = 0.60   |   |  |                  |   |
| 30  |                         |  | eC   | 2.4/33.41/75  | Default = 2.43   |   |  |                  |   |
| 31  |                         |  | eD   | 2.4/33.41/75  | Default = 2.43 (1 samp) No. of sample                                | 1   | **The Maximum Daily Limit is calculated from the lowest LTA, X's etc. The LTAs and MDL using it are driven by the ACR. |                  |   |
| 32  |                         |  | LTA <sub>a</sub>   | 2.63004608    | WLAac X's eA   |   |  |                  |   |
| 33  |                         |  | LTA <sub>c</sub>   | 1.310261314   | WLAc X's eB  |   |  |                  |   |
| 34  |                         |  | MDL** with LTA <sub>a</sub>  | 6.4000001567  | TU <sub>c</sub>  | NOEC =  | 15.6/250000 (Protects from acute/chronic toxicity)   | Rounded NOEC's % |   |
| 35  |                         |  | MDL** with LTA <sub>c</sub>  | 3.183412811   | TU <sub>c</sub>  | NOEC =  | 31.3633567 (Protects from chronic toxicity)  | NOEC =           | 16 %  |
| 36  |                         |  | AML with lowest LTA  | 3.183412811   | TU <sub>c</sub>  | NOEC =  | 31.3633567 Lowest LTA X's eD   | NOEC =           | 32 %  |
| 37  |                         |  | IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU TO TU <sub>a</sub> |               |  |   |  |                  |   |
| 38  |                         |  | MDL with LTA <sub>a</sub>  | 0.640000016   | TU <sub>a</sub>  | LC50 =  | 156.249996 %   | Use NOAEC=100%   | Rounded LC50's %  |
| 39  |                         |  | MDL with LTA <sub>c</sub>  | 0.318341281   | TU <sub>a</sub>  | LC50 =  | 313.535674 %   | Use NOAEC=100%   | LC50 = NA %   |



Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

o determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, Caco<sub>2</sub>, and chronic tested at the same temperature. The chronic NOEC must be less than the acute NOEC. L<sub>Co</sub> < 100% should not be used.

**Table 1.** ACR using Vertebrate data

| Table 3.           |                  |      |          |           |         |         |                          |  |  |
|--------------------|------------------|------|----------|-----------|---------|---------|--------------------------|--|--|
| for use in WLA.EXE |                  |      |          |           |         |         |                          |  |  |
| ACR used: 10       |                  |      |          |           |         |         |                          |  |  |
| Set #              | LC <sub>so</sub> | NOEC | Test ACR | Logarithm | Geomean | Antilog | ACR to Use               |  |  |
| 1                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 2                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 3                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 4                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 5                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 6                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 7                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 8                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 9                  | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
| 10                 | #N/A             | #N/A | #N/A     | #N/A      | #N/A    | #N/A    | NO DATA                  |  |  |
|                    |                  |      |          |           |         |         | ACR for vertebrate data: |  |  |
|                    |                  |      |          |           |         |         | 0                        |  |  |
|                    |                  |      |          |           |         |         | 10                       |  |  |
|                    |                  |      |          |           |         |         | 11                       |  |  |
|                    |                  |      |          |           |         |         | 12                       |  |  |
|                    |                  |      |          |           |         |         | 13                       |  |  |

Table 1. Result.

#N/A #N/A

| DILUTION SERIES TO RECOMMEND       |                       |                  |       |
|------------------------------------|-----------------------|------------------|-------|
|                                    | Monitoring % Effluent | Limit % Effluent | TUC   |
| Dilution series based on data mean | 76.3                  | 1.310261         |       |
| Dilution series to use if limit    |                       | 32               | 3.125 |
| Dilution factor to recommend:      | 0.8736169             | 0.5656854        |       |
| Dilution series to recommend:      | 100.0                 | 100.0            | 1.00  |
|                                    | 87.4                  | 1.14             | 56.6  |
|                                    | 76.3                  | 1.31             | 32.0  |
|                                    | 65.7                  | 1.50             | 18.1  |
|                                    | 58.25                 | 1.72             | 10.2  |
| Extra dilutions if needed          | 50.89                 | 1.97             | 5.8   |
|                                    | 44.46                 | 2.25             | 3.3   |
|                                    | 37.0                  | 2.50             | 3.052 |
|                                    | 31.25                 | 2.75             |       |
|                                    | 26.5                  | 3.00             |       |
|                                    | 22.4                  | 3.25             |       |
|                                    | 18.75                 | 3.50             |       |
|                                    | 15.6                  | 3.75             |       |
|                                    | 12.5                  | 4.00             |       |
|                                    | 10.0                  | 4.25             |       |
|                                    | 8.0                   | 4.50             |       |
|                                    | 6.25                  | 4.75             |       |
|                                    | 5.0                   | 5.00             |       |
|                                    | 4.0                   | 5.25             |       |
|                                    | 3.125                 | 5.50             |       |
|                                    | 2.5                   | 5.75             |       |
|                                    | 2.0                   | 6.00             |       |
|                                    | 1.6                   | 6.25             |       |
|                                    | 1.31                  | 6.50             |       |
|                                    | 1.0                   | 6.75             |       |
|                                    | 0.8                   | 7.00             |       |
|                                    | 0.64                  | 7.25             |       |
|                                    | 0.512                 | 7.50             |       |
|                                    | 0.4096                | 7.75             |       |
|                                    | 0.32768               | 8.00             |       |
|                                    | 0.256                 | 8.25             |       |
|                                    | 0.205                 | 8.50             |       |
|                                    | 0.164                 | 8.75             |       |
|                                    | 0.131                 | 9.00             |       |
|                                    | 0.105                 | 9.25             |       |
|                                    | 0.084                 | 9.50             |       |
|                                    | 0.067                 | 9.75             |       |
|                                    | 0.054                 | 10.00            |       |
| ACR for vertebrate data:           | 0                     |                  |       |

Cell: I9

Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18

Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22

Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40

Comment: If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41

Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48

Comment: See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G2

Comment: Vertebrates are:

Pimelodus promelas

Oncorhynchus mykiss

Cyprinodon variegatus

Cell: J82

Comment: Invertebrates are:

Ceriodaphnia dubia

Mysidopsis bahia

Cell: C117

Comment: Vertebrates are:

Pimelodus promelas

Cyprinodon variegatus

Cell: M119

Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121

Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138

Comment: Invertebrates are:

Ceriodaphnia dubia

Mysidopsis bahia

## ATTACHMENT 5

### Metals Specific Target Values for Water Quality Criteria Monitoring

|         |                   |            |        |
|---------|-------------------|------------|--------|
|         |                   | HARDNESS   |        |
| ACUTE   | COPPER ug/l       | WQSACUTE   | 100.00 |
| CHRONIC |                   | WQSCHRONIC | 13.4   |
|         |                   |            | 9.0    |
|         |                   | HARDNESS   |        |
| ACUTE   | LEAD ug/l         | WQSACUTE   | 100.00 |
| CHRONIC |                   | WQSCHRONIC | 118.91 |
|         |                   |            | 13.51  |
|         |                   | HARDNESS   |        |
| ACUTE   | ZINC ug/l         | WQSACUTE   | 100.00 |
| CHRONIC |                   | WQSCHRONIC | 119.82 |
|         |                   |            | 119.82 |
|         |                   | HARDNESS   |        |
| ACUTE   | CADMIUM ug/l      | WQSACUTE   | 100.00 |
| CHRONIC |                   | WQSCHRONIC | 3.92   |
|         |                   |            | 1.13   |
|         |                   | HARDNESS   |        |
| ACUTE   | CHROMIUM III ug/l | WQSACUTE   | 100.00 |
| CHRONIC |                   | WQSCHRONIC | 569.76 |
|         |                   |            | 74.11  |
|         |                   | HARDNESS   |        |
| ACUTE   | NICKEL ug/l       | WQSACUTE   | 100.00 |
| CHRONIC |                   | WQSCHRONIC | 182.36 |
|         |                   |            | 20.27  |
|         |                   | HARDNESS   |        |
| ACUTE   | SIVER ug/l        | WQSACUTE   | 100.00 |
|         |                   |            | 3.45   |

Western Washington County Water Reclamation Facility

Metals Calculation for Attachment A, 0.5 mgd

WCA formula = chronic standard ( $7410 + \text{effluent flow}$ ) / effluent flow

Antimony: WCA =  $640 (1.77 + 0.5) / 0.5 \text{ ug/l} = 2926 \text{ ug/l}$

Arsenic: WCA =  $150 (1.77 + 0.5) / 0.5 \text{ ug/l} = 600 \text{ ug/l}$

Cadmium: WCA =  $1.13 (1.77 + 0.5) / 0.5 \text{ ug/l} = 5.1 \text{ ug/l}$

Chromium  $\text{III}$ : WCA =  $74.11 (1.77 + 0.5) / 0.5 \text{ ug/l} = 356 \text{ ug/l}$

Chromium  $\text{VI}$ : WCA =  $11 (1.77 + 0.5) / 0.5 \text{ ug/l} = 50 \text{ ug/l}$

Copper: WCA =  $9.0 (1.77 + 0.5) / 0.5 \text{ ug/l} = 41 \text{ ug/l}$

Lead: WCA =  $13.51 (1.77 + 0.5) / 0.5 \text{ ug/l} = 61 \text{ ug/l}$

Mercury: WCA =  $0.27 (1.77 + 0.5) / 0.5 \text{ ug/l} = 3.5 \text{ ug/l}$

Selenium: WCA =  $5.0 (1.77 + 0.5) / 0.5 \text{ ug/l} = 23 \text{ ug/l}$

Silver: WCA =  $3.45 (\frac{\text{acute } 1910}{1.70 + 0.5}) / 0.5 \text{ ug/l} = 15 \text{ ug/l}$

Zinc: WCA =  $119.82 (1.77 + 0.5) / 0.5 \text{ ug/l} = 544 \text{ ug/l}$

Nickel: WCA =  $20.27 (1.77 + 0.5) / 0.5 \text{ ug/l} = 92 \text{ ug/l}$

Western Washington County Water Reclamation Facility  
Metals Calculations for Attachment A, 1.0 m<sup>3</sup>/d

WLA formula = chronic standard ( $\text{Q}_{10}$  + effluent flow) / effluent flow

Antimony: WLA =  $640(1.77 + 1.0)/1.0 \text{ ug/l} = \frac{500}{1773} \text{ ug/l}$

Arsenic: WLA =  $150(1.77 + 1.0)/1.0 \text{ ug/l} = \frac{400}{446} \text{ ug/l}$

Cadmium: WLA =  $1.13(1.77 + 1.0)/1.0 \text{ ug/l} = 3.1 \text{ ug/l}$

Chromium III: WLA =  $74.4(1.77 + 1.0)/1.0 \text{ ug/l} = \frac{200}{205} \text{ ug/l}$

Chromium VI: WLA =  $11(1.77 + 1.0)/1.0 \text{ ug/l} = 3.0 \text{ ug/l}$

Copper: WLA =  $9.0(1.77 + 1.0)/1.0 \text{ ug/l} = 2.5 \text{ ug/l}$

Lead: WLA =  $13.51(1.77 + 1.0)/1.0 \text{ ug/l} = 3.7 \text{ ug/l}$

Mercury: WLA =  $0.77(1.77 + 1.0)/1.0 \text{ ug/l} = 2.1 \text{ ug/l}$

Selenium: WLA =  $5.0(1.77 + 1.0)/1.0 \text{ ug/l} = 14 \text{ ug/l}$

Silver: WLA =  $3.45(\sqrt[5]{\text{Q}_{10}} + 1.0)/1.0 \text{ ug/l} = \frac{\text{acute}}{9.3} \text{ ug/l}$

Zincs: WLA =  $119.82(1.77 + 1.0)/1.0 \text{ ug/l} = \frac{300}{332} \text{ ug/l}$

Nickel: WLA =  $20.27(1.77 + 1.0)/1.0 \text{ ug/l} = 56 \text{ ug/l}$

Western Washington County Water Reclamation Facility  
Metals Calculations for Attachment A, 1.5 maf

WLA formula = chronic standard ( $\frac{70}{10}$  + effluent flow) / effluent flow

Antimony: WLA =  $640(1.77 + 1.5)/1.5 \text{ ug/l} = \frac{500}{1.395} \text{ ug/l}$

Arsenic: WLA =  $150(1.77 + 1.5)/1.5 \text{ ug/l} = \frac{300}{327} \text{ ug/l}$

Cadmium: WLA =  $1.13(1.77 + 1.5)/1.5 \text{ ug/l} = 2.5 \text{ ug/l}$

Chromium III: WLA =  $74.4(1.77 + 1.5)/1.5 \text{ ug/l} = \frac{160}{162} \text{ ug/l}$

Chromium VI: WLA =  $11(1.77 + 1.5)/1.5 \text{ ug/l} = 24 \text{ ug/l}$

Copper: WLA =  $9.0(1.77 + 1.5)/1.5 \text{ ug/l} = 20 \text{ ug/l}$

Lead: WLA =  $13.51(1.77 + 1.5)/1.5 \text{ ug/l} = 29 \text{ ug/l}$

Mercury: WLA =  $0.77(1.77 + 1.5)/1.5 \text{ ug/l} = 1.7 \text{ ug/l}$

Selenium: WLA =  $5.0(1.77 + 1.5)/1.5 \text{ ug/l} = 11 \text{ ug/l}$

Silver: WLA =  $3.45 \downarrow \text{acute} (1.70 \frac{10}{10} + 1.5)/1.5 \text{ ug/l} = 2.4 \text{ ug/l}$

Zincs: WLA =  $119.82(1.77 + 1.5)/1.5 \text{ ug/l} = \frac{260}{264} \text{ ug/l}$

Nickel: WLA =  $20.27(1.77 + 1.5)/1.5 \text{ ug/l} = 44 \text{ ug/l}$

ATTACHMENT 6

303 (d) Fact Sheets

TMDL

## Wyatt, Frederick (DEQ)

**From:** Frazier, Teresa (DEQ)  
**Sent:** Thursday, May 21, 2015 3:31 PM  
**To:** Wyatt, Frederick (DEQ)  
**Subject:** Beaver Creek request  
**Attachments:** Beaver Ck factsheets.pdf; T&E\_BeaverCk.pdf

Fred,  
Outfall 001 river mile is 6CBEV023.81, in Section 4, Class V, stockable trout waters.  
TMDL segment is VAS-O07R\_BEV02A94, factsheets attached.

I couldn't get DGIF map page to print. I will try first thing tomorrow.

Teresa Frazier  
DEQ Southwest Regional Office | 276.676.4805 | [Teresa.Frazier@deq.virginia.gov](mailto:Teresa.Frazier@deq.virginia.gov)  
355-A Deadmore Street, Abingdon, VA 24210

<http://www.deq.virginia.gov>



## 2014 Impaired Waters SWRO Categories 4 and 5

Cause Group Code: O07R-01-PCB

Beaver Creek and Little Creek

Location: This segment includes the headwaters of Beaver Creek downstream to the Tennessee political boundary and Little Creek from the headwaters downstream to the Tennessee political boundary in the City of Bristol.

City / County: Bristol City Washington Co.

Use(s): Fish Consumption

Cause(s) /

VA Category: PCB in Fish Tissue/ 5A

Fish tissue stations (6CBEV015.27 and 6CLTL000.26) found polychlorinated biphenyls (PCB's) in carp and stonerollers above DEQ's screening value.

| Assessment Unit / Water Name / Description  | Cause Category / Name | Nested | TMDL Cycle First Listed | Schedule or EPA Approval | Size |
|---|-----------------------|--------|-------------------------|--------------------------|------|
| VAS-O07R_BEV01A94 / Beaver Creek / Mainstem from Beaver Creek dam downstream to Tennessee state line including tributaries, section 4.                  | 5A PCB in Fish Tissue |        | 2006                    | 2016                     | 7.29 |
| VAS-O07R_BEV02A94 / Beaver Creek / From headwaters of Beaver Creek near Ratcliff Knob downstream to Beaver Creek flood control dam, section 4, DGIF vi. | 5A PCB in Fish Tissue |        | 2006                    | 2016                     | 7.77 |
| VAS-O07R_LTL01A96 / Little Creek / Headwaters, downstream to the Tennessee state line in the City of Bristol, WQS Section 4.                            | 5A PCB in Fish Tissue |        | 2006                    | 2018                     | 2.29 |

| Beaver Creek and Little Creek | Estuary (Sq. Miles) | Reservoir (Acres) | River (Miles) |
|-------------------------------|---------------------|-------------------|---------------|
| Fish Consumption              |                     |                   | 17.35         |

Sources:

Inappropriate Waste Disposal



## 2014 Impaired Waters

### SWRO Categories 4 and 5

Cause Group Code: O07R-01-BEN

Beaver Creek

Location: This segment includes the mainstem from the headwaters of Beaver Creek downstream to the Tennessee political boundary including its tributaries.

City / County: Bristol City Washington Co.

Use(s): Aquatic Life

Cause(s) /  
VA Category: Benthic-Macroinvertebrate Bioassessments/ 4A Sedimentation/Siltation/ 4A

The biological station located at 6CBEV023.99 was found to be impaired based on VSCI scores.

| Assessment Unit / Water Name / Description  | Cause Category / Name                       | Nested | TMDL                |                          |               |
|---|---|--------|---------------------|--------------------------|---------------|
|   |   |        | Cycle First Listed  | Schedule or EPA Approval | Size          |
| VAS-O07R_BEV01A94 / Beaver Creek / Mainstem from Beaver Creek dam downstream to Tennessee state line including tributaries, section 4.                  | 4A Benthic-Macroinvertebrate Bioassessments |        | 1998                | 7/6/2004                 | 7.29          |
| VAS-O07R_BEV02A94 / Beaver Creek / From headwaters of Beaver Creek near Ratcliff Knob downstream to Beaver Creek flood control dam, section 4, DGIF vi. | 4A Benthic-Macroinvertebrate Bioassessments |        | 1998                | 7/6/2004                 | 7.77          |
| <b>Beaver Creek<br/>Aquatic Life</b>  |   |        | Estuary (Sq. Miles) | Reservoir (Acres)        | River (Miles) |
| <b>Benthic-Macroinvertebrate Bioassessments - Total Impaired Size by Water Type:</b>  |   |        |                     |                          | <b>15.06</b>  |

| Assessment Unit / Water Name / Description  | Cause Category / Name      | Nested | TMDL                |                          |               |
|---|----------------------------|--------|---------------------|--------------------------|---------------|
|   |                            |        | Cycle First Listed  | Schedule or EPA Approval | Size          |
| VAS-O07R_BEV01A94 / Beaver Creek / Mainstem from Beaver Creek dam downstream to Tennessee state line including tributaries, section 4.                  | 4A Sedimentation/Siltation |        | 2010                | 7/6/2004                 | 7.29          |
| VAS-O07R_BEV02A94 / Beaver Creek / From headwaters of Beaver Creek near Ratcliff Knob downstream to Beaver Creek flood control dam, section 4, DGIF vi. | 4A Sedimentation/Siltation |        | 2010                | 7/6/2004                 | 7.77          |
| <b>Beaver Creek<br/>Aquatic Life</b>  |                            |        | Estuary (Sq. Miles) | Reservoir (Acres)        | River (Miles) |
| <b>Sedimentation/Siltation - Total Impaired Size by Water Type:</b>   |                            |        |                     |                          | <b>15.06</b>  |

Sources:

Crop Production (Crop Land or Dry Land)

Rural (Residential Areas)

Unrestricted Cattle Access

Urban Runoff/Storm Sewers



# 2014 Impaired Waters

## SWRO Categories 4 and 5

Cause Group Code: O07R-01-BAC

### Beaver Creek and Tributaries

Location: This segment includes the headwaters of Beaver Creek downstream to the Tennessee political boundary. It also includes the headwaters of Little Creek, including Mumpower Creek, downstream to the Tennessee political boundary in the City of Bristol.

City / County: Bristol City Washington Co.

Use(s): Recreation

Cause(s) /

VA Category: Escherichia coli/ 4A Fecal Coliform/ 4A

The AWQM and TMDL stations revealed a 89% exceedance of the E.coli water quality standard at 6CBEV015.27, a 41% exceedance at 6CMUM000.65, a 75% exceedance at 6CXDR000.34 and a 87% exceedance at 6CLTL000.26.

| Assessment Unit / Water Name / Description  | Cause Category / Name | Nested | TMDL Cycle First Listed | Schedule or EPA Approval | Size |
|---|-----------------------|--------|-------------------------|--------------------------|------|
| VAS-O07R_BEV01A94 / Beaver Creek / Mainstem from Beaver Creek dam downstream to Tennessee state line including tributaries, section 4.                  | 4A Escherichia coli   |        | 2006                    | 7/6/2004                 | 7.29 |
| VAS-O07R_BEV02A94 / Beaver Creek / From headwaters of Beaver Creek near Ratcliff Knob downstream to Beaver Creek flood control dam, section 4, DGIF vi. | 4A Escherichia coli   |        | 2006                    | 7/6/2004                 | 7.77 |
| VAS-O07R_LTL01A96 / Little Creek / Headwaters, downstream to the Tennessee state line in the City of Bristol, WQS Section 4.                            | 4A Escherichia coli   |        | 2006                    | 6/5/2002                 | 2.29 |
| VAS-O07R_MUM01A06 / Mumpower Creek / A tributary to Little Creek north of Bristol City limits, WQS Section 4.   | 4A Escherichia coli   |        | 2006                    | 7/6/2004                 | 2.90 |
| VAS-O07R_XDR01A06 / Little Creek / Headwaters downstream to the confluence of Mumpower Creek parallel to Campground Road in WQS Section 4.              | 4A Escherichia coli   |        | 2006                    | 7/6/2004                 | 2.80 |

| Beaver Creek and Tributaries  | Estuary (Sq. Miles) | Reservoir (Acres) | River (Miles) |
|---|---------------------|-------------------|---------------|
| Recreation<br>Escherichia coli - Total Impaired Size by Water Type: |                     |                   | 23.05         |

| Assessment Unit / Water Name / Description   | Cause Category / Name | Nested | TMDL Cycle First Listed | Schedule or EPA Approval | Size |
|--|-----------------------|--------|-------------------------|--------------------------|------|
| VAS-O07R_LTL01A96 / Little Creek / Headwaters, downstream to the Tennessee state line in the City of Bristol, WQS Section 4. | 4A Fecal Coliform     |        | 2004                    | 7/6/2004                 | 2.29 |

| Beaver Creek and Tributaries                                      | Estuary (Sq. Miles) | Reservoir (Acres) | River (Miles) |
|---|---------------------|-------------------|---------------|
| Recreation<br>Fecal Coliform - Total Impaired Size by Water Type: |                     |                   | 2.29          |

Sources:

Rural (Residential Areas) Unrestricted Cattle Access Wastes from Pets

**Table 5-3.** Average annual in-stream *E. coli* bacterial loads (cfu/yr) modeled after TMDL allocation at the outlet of the Beaver Creek watershed.

| Impairment                                | WLA      | LA       | MOS | TMDL     |
|---|----------|----------|-----|----------|
| Beaver Creek                              | 4.80E+12 | 8.36E+13 |     | 8.84E+13 |
| VAG400012                                 | 1.74E+09 |          |     |          |
| VAG400209                                 | 1.74E+09 |          |     |          |
| VAG400210                                 | 1.74E+09 |          |     |          |
| VPG210001                                 | 0.00E+00 |          |     |          |
| <i>City of Bristol MS4</i><br>(VAR040048) | 1.30E+12 |          |     |          |
| <i>Proposed Permit</i>                    | 2.61E+12 |          |     |          |
| <i>Future Load</i>                        | 8.84E+11 |          |     |          |

*Implicit*

Starting in 2007, the USEPA has mandated that TMDL studies include a daily load as well as the average annual load previously shown. The approach to developing a daily maximum load was similar to the USEPA approved approach to developing load duration bacterial TMDLs. The daily maximum in-stream loads for Beaver Creek are shown in **Table 5-4**. The daily TMDL was calculated using the 99<sup>th</sup> percentile daily flow condition during the allocation time period at the numeric water quality criterion of 235 cfu/100mL. This calculation of the daily TMDL does not account for varying stream flow conditions.

**Table 5-4.** Maximum daily in-stream *E. coli* bacterial loads (cfu/day) modeled after TMDL allocation at the outlet of the Beaver Creek watershed.

| Impairment                                | WLA      | LA       | MOS | TMDL     |
|---|----------|----------|-----|----------|
| Beaver Creek                              | 2.68E+10 | 1.58E+12 |     | 1.61E+12 |
| VAG400012                                 | 4.77E+06 |          |     |          |
| VAG400209                                 | 4.77E+06 |          |     |          |
| VAG400210                                 | 4.77E+06 |          |     |          |
| VPG210001                                 | 0.00E+00 |          |     |          |
| <i>City of Bristol MS4</i><br>(VAR040048) | 3.56E+09 |          |     |          |
| <i>Proposed Permit</i>                    | 7.15E+09 |          |     |          |
| <i>Future Load</i>                        | 1.61E+10 |          |     |          |

*Implicit*

Table 10-6. Final annual sediment TMDL for the Beaver Creek watershed.

| Impairment                                 | WLA<br>t/yr | LA<br>t/yr | MOS<br>t/yr | TMDL<br>t/yr |
|--|-------------|------------|-------------|--------------|
| Beaver Creek                               | 310.91      | 1985.74    | 255.24      | 2551.90      |
| VAG400012                                  | 0.041       |            |             |              |
| VAG400209                                  | 0.041       |            |             |              |
| VAG400210                                  | 0.041       |            |             |              |
| VPG210001                                  | 0           |            |             |              |
| <i>City of Bristol MS4<br/>(VAR040048)</i> | 159.97      |            |             |              |
| VAR050028                                  | 8.65        |            |             |              |
| VAR050043                                  | 12.99       |            |             |              |
| VAR050053                                  | 7.04        |            |             |              |
| VAR050080                                  | 3.41        |            |             |              |
| VAR050081                                  | 2.55        |            |             |              |
| VAR050084                                  | 11.26       |            |             |              |
| VAR050468                                  | 6.49        |            |             |              |
| VAR051522                                  | 1.29        |            |             |              |
| VAR051907                                  | 2.93        |            |             |              |
| <i>Construction Permits</i>                | 6.48        |            |             |              |
| <i>Proposed Permit</i>                     | 62.22       |            |             |              |
| <i>Future Load</i>                         | 25.52       |            |             |              |

Starting in 2007, the USEPA has mandated that TMDL studies include a maximum “daily” load (MDL) as well as the average annual load previously shown. The approach to developing a daily maximum load was similar to the USEPA approved approach found in the 2007 document titled Options for Expressing Daily Loads in TMDLs (USEPA, 2007). The procedure involved calculating the MDL from the long-term average annual TMDL load in addition to a coefficient of variation (VC) estimated from the annual load for ten years. The long-term annual sediment load for Beaver Creek had a coefficient of variation (CV) of 0.353. A multiplier was calculated based on the USEPA guidance that was used to estimate the MDL from the long-term average. The multiplier estimated for Beaver Creek was 2.47. The annual TMDL divided by 365 days (6.99 t/day) was multiplied by the 2.47, resulting in an MDL of 17.28 t/day. The daily WLA was

estimated as the annual WLA divided by 365. The daily MOS was estimated as 10% of the MDL. Finally, the daily LA was estimated as the MDL minus the daily MOS and the daily WLA. These results are shown in Table 10-7.

**Table 10-7. Final daily sediment TMDL for the Beaver Creek watershed.**

| Impairment                                 | WLA     | LA    | MOS   | TMDL  |
|--|---------|-------|-------|-------|
|  | t/day   | t/day | t/day | t/day |
| Beaver Creek                               | 0.85    | 14.70 | 1.73  | 17.28 |
| <i>VAG400012</i>                           | 0.00011 |       |       |       |
| <i>VAG400209</i>                           | 0.00011 |       |       |       |
| <i>VAG400210</i>                           | 0.00011 |       |       |       |
| <i>VPG210001</i>                           | 0       |       |       |       |
| <i>City of Bristol MS4<br/>(VAR040048)</i> | 0.438   |       |       |       |
| <i>VAR050028</i>                           | 0.024   |       |       |       |
| <i>VAR050043</i>                           | 0.036   |       |       |       |
| <i>VAR050053</i>                           | 0.019   |       |       |       |
| <i>VAR050080</i>                           | 0.009   |       |       |       |
| <i>VAR050081</i>                           | 0.007   |       |       |       |
| <i>VAR050084</i>                           | 0.031   |       |       |       |
| <i>VAR050468</i>                           | 0.018   |       |       |       |
| <i>VAR051522</i>                           | 0.004   |       |       |       |
| <i>VAR051907</i>                           | 0.008   |       |       |       |
| <i>Construction Permits</i>                | 0.018   |       |       |       |
| <i>Proposed Permit</i>                     | 0.170   |       |       |       |
| <i>Future Load</i>                         | 0.070   |       |       |       |

ATTACHMENT 7  
T & E Species



## VPDES PERMITS

### Threatened and Endangered Species Coordination

**To:**

- ( X ) DGIF, Environmental Review Coordinator  
( ) DCR  
( X ) USFWS, T/E Review Coordinator

Date Sent: 04/29/2016

**From:** Fred M. Wyatt

DEQ, Southwest Regional Office  
355-A Deadmore Street  
Abingdon, VA 24210  
[frederick.wyatt@deq.virginia.gov](mailto:frederick.wyatt@deq.virginia.gov)

Permit Number: VA0092860

**Facility Name:** Western Washington County Water Reclamation Facility

**Location:** Off Bordwine Road, Bristol, VA

**Contact:** Washington County Service Authorityity  
Robert C.H. Cornett, General Manager

**USGS Quadrangle:** Wyndale, VA

**Phone:** (276) 628-7151

**Latitude/Longitude:** 36°39'25"/82°06'15"

**Address:** 25122 Regal Drive  
Abingdon, VA 24211

**Receiving Stream:** Beaver Creek

**Receiving Stream Flow Statistics used for Permit:**  
1Q10 Flow = 1.70 MGD  
7Q10 Flow = 1.77 MGD  
30Q10 Flow = 2.00 MGD

**Topo Map Attached**

**Effluent Characteristics and Max Daily Flow:**  
See attached draft permit and fact sheet.

**Species Search Results (or attach database report and map):**

**No T&E Species Confirmed**

DGIF email: [ProjectReview@dgif.virginia.gov](mailto:ProjectReview@dgif.virginia.gov) to Ernie Aschenbach attention.

USFWS email: : [susan\\_lingenfelser@fws.gov](mailto:susan_lingenfelser@fws.gov)

DCR: Natural Heritage Data Explorer (NHDE) has the needed information.

## **Wyatt, Frederick (DEQ)**

---

**From:** nhreview (DCR)  
**Sent:** Monday, June 22, 2015 3:44 PM  
**To:** Wyatt, Frederick (DEQ)  
**Cc:** Orndorff, Wil (DCR)  
**Subject:** VA0092860-Western Washington County Water Reclamation Facility  
**Attachments:** 69102, DEQ VA0092860, Western Washington County Water Reclamation Facility.pdf

Please find attached the DCR-DNH comments for the above referenced project. The comments are in pdf format and can be printed for your records. Also species rank information is available at [http://www.dcr.virginia.gov/natural\\_heritage/help.shtml](http://www.dcr.virginia.gov/natural_heritage/help.shtml) for your reference.

An updated information services order form is located on the Natural Heritage website at:  
[http://www.dcr.virginia.gov/natural\\_heritage/nhserviceform/?non\\_fee](http://www.dcr.virginia.gov/natural_heritage/nhserviceform/?non_fee).

Thank you for the opportunity to comment on this project.

Rene'

S. Rene' Hypes  
Project Review Coordinator  
Department of Conservation and Recreation  
Division of Natural Heritage  
600 East Main Street, 24<sup>th</sup> Floor  
Richmond, Virginia 23219  
804-371-2708 (phone)  
804-371-2674 (fax)  
[rene.hypes@dcr.virginia.gov](mailto:rene.hypes@dcr.virginia.gov)



**Conserving VA's Biodiversity through  
Inventory, Protection and Stewardship**  
[www.dcr.virginia.gov/natural\\_heritage](http://www.dcr.virginia.gov/natural_heritage)  
[Virginia Natural Heritage Program on Facebook](#)

Molly Joseph Ward  
Secretary of Natural Resources

Clyde E. Cristman  
Director



Joe Elton  
Deputy Director of Operations

Rochelle Altholz  
Deputy Director of Administration  
and Finance

**COMMONWEALTH of VIRGINIA**  
**DEPARTMENT OF CONSERVATION AND RECREATION**

600 East Main Street, 24<sup>th</sup> Floor  
Richmond, Virginia 23219  
(804)786-6124

June 22, 2015

Fred Wyatt  
DEQ –Southwest Regional Office  
355-A Deadmore Street  
Abingdon, VA 24210

Re: VA0092860-Western Washington County Water Reclamation Facility

Dear Mr. Wyatt:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

This project is situated on karst-forming carbonate rock and can be characterized by sinkholes, caves, disappearing streams, and large springs. Please coordinate with Wil Orndorff (540-230-5960), [Wil.Orndorff@dcr.virginia.gov](mailto:Wil.Orndorff@dcr.virginia.gov) to document and minimize adverse impacts to karst features from the proposed project. Discharge of runoff to sinkholes or sinking streams, filling of sinkholes, and alteration of cave entrances can lead to surface collapse, flooding, erosion and sedimentation, groundwater contamination, and degradation of subterranean habitat for natural heritage resources. If the project involves filling or “improvement” of sinkholes or cave openings, DCR would like detailed location information and copies of the design specifications. In cases where sinkhole improvement is for stormwater discharge, copies of VDOT Form EQ-120 will suffice. New “Karst Assessment Guidelines” developed by the Virginia Cave Board for land development can be found at [http://www.dcr.virginia.gov/natural\\_heritage/documents/karst\\_assessment\\_guidelines.pdf](http://www.dcr.virginia.gov/natural_heritage/documents/karst_assessment_guidelines.pdf).

There are no State Natural Area Preserves under DCR’s jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

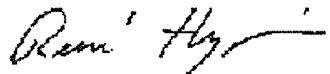
New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database

may be accessed from <http://vafwis.org/fwis/> or contact Ernie Aschenbach at 804-367-2733 or  
[Ernie.Aschenbach@dgif.virginia.gov](mailto:Ernie.Aschenbach@dgif.virginia.gov).

Should you have any questions or concerns, feel free to contact René Hypes at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,



S. René Hypes  
Project Review Coordinator

CC: Wil Orndorff, DCR-Karst

## **Wyatt, Frederick (DEQ)**

---

**From:** vanhde@natureserve.org  
**Sent:** Thursday, May 28, 2015 1:29 PM  
**To:** Wyatt, Frederick (DEQ)  
**Subject:** Western Washington County Water Reclamation Facility has completed initial review

Dear Clairise R Shaheen,

An initial review of your project, entitled 'Western Washington County Water Reclamation Facility', has been completed. The resulting report can be found [here](#). To view the project page, shapefile and any attachments, click [here](#). If natural heritage resources are documented or predicted within the search radius, DCR will provide additional comments via email within thirty calendar days or within 5 business days if priority service was selected. If no natural heritage resources are documented or predicted within the search radius, no further coordination is needed with this office. The report can be saved and/or printed for your files.

Thank you for submitting this project for review.

DCR-VA Natural Heritage Program



Department of Conservation & Recreation  
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

Client Project Number: VA0092860

Web Project ID: WEB00000003693

## PROJECT INFORMATION

**TITLE:** Western Washington County Water Reclamation Facility

**DESCRIPTION:** Proposed construction of new 0.50 MGD WWTP with discharge into Beaver Creek

**EXISTING SITE CONDITIONS:** Proposed discharge is to Beaver Creek at river mile 6CBEV023.81 with estimated complete mix at 100 feet at low flow

**QUADRANGLES:** Wyndale

**COUNTIES:** Washington

**Latitude/Longitude (DMS):** 36°39'24.7863"N / 82°6'15.5046"W

**Acreage:** 0 acres

**Comments:** Limits are based on the following flow frequencies for Beaver Creek: 1Q10: Stream Flow : 1.70 MGD 7Q10 Stream Flow: 1.77 MGD 30Q10 Stream Flow: 2.00 MGD

## REQUESTOR INFORMATION

**Priority:** N

**Contact Name:** Fred Wyatt

**Company Name:** Department of Environmental Quality

**Address:** 355-A Deadmore Street

**City:** Abingdon

**Zip:** 24210

**Tier Level:** Tier II

**Tax ID:**

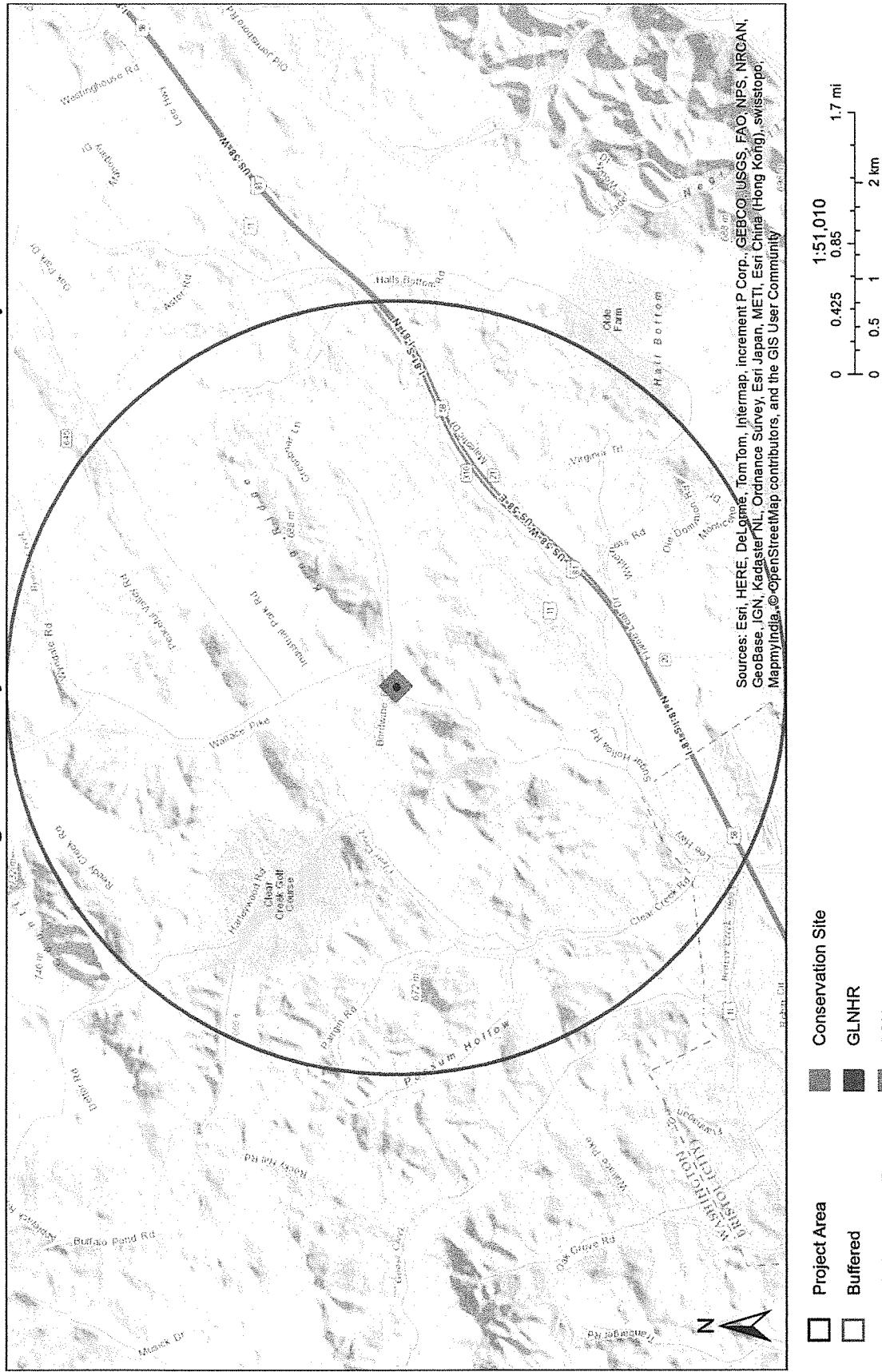
Phone: 276-676-4810

Fax: 276-676-4899

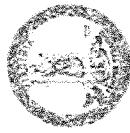
Email: [frederick.wyatt@deq.virginia.gov](mailto:frederick.wyatt@deq.virginia.gov)

| Conservation Site  |            | Site Type   |                 | Brank | Acreage | Listed Species Presence |              |         |               |           |
|--|------------|-------------|-----------------|-------|---------|-------------------------|--------------|---------|---------------|-----------|
| Natural Heritage Screening Features within Search Radius |            |             |                 |       |         |                         |              |         |               |           |
| Site Name  | Group Name | Common Name | Scientific Name | GRANK | SIRANK  | Fed Status              | State Status | EO Rank | Last Obs Date | Precision |
| <b>Natural Heritage Resources within Search Radius</b>   |            |             |                 |       |         |                         |              |         |               |           |
| <b>Intersecting Predictive Models</b>                    |            |             |                 |       |         |                         |              |         |               |           |
| <b>Karst Bedrock</b>                                     |            |             |                 |       |         |                         |              |         |               |           |
| <b>Predictive Model Results</b>                          |            |             |                 |       |         |                         |              |         |               |           |

## Western Washington County Water Reclamation Facility



Molly Joseph Ward  
Secretary of Natural Resources



COMMONWEALTH of VIRGINIA  
DEPARTMENT OF CONSERVATION AND RECREATION

Clyde E. Cristman  
Director

The project mapped as part of this report has been searched against the Department of Conservation and Recreation's Biotics Data System for occurrences of natural heritage resources from the area indicated for this project. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in Biotics files, NATURAL HERITAGE RESOURCES HAVE BEEN DOCUMENTED within two miles of the indicated project boundaries and/or POTENTIAL HABITAT FOR NATURAL HERITAGE RESOURCES intersect the project area.

You have submitted this project to DCR for a more detailed review for potential impacts to natural heritage resources. DCR will review the submitted project to identify the specific natural heritage resources in the vicinity of the proposed project. Using the expertise of our biologists, DCR will evaluate whether your specific project is likely to impact these resources, and if so how. DCR's response will indicate whether any negative impacts are likely and, if so, make recommendations to avoid, minimize and/or mitigate these impacts. If the potential negative impacts are to species that are state- or federally-listed as threatened or endangered, DCR will also recommend coordination with the appropriate regulatory agencies: the Virginia Department of Game and Inland Fisheries for state-listed animals, the Virginia Department of Agriculture and Consumer Services for state-listed plants and insects, and the United States Fish and Wildlife Service for federally listed plants and animals. If your project is expected to have positive impacts we will report those to you with recommendations for enhancing these benefits.

**There will be a charge for this service for "for profit companies": \$60, plus an additional charge of \$35 for 1-5 occurrences and \$60 for 6 or more occurrences.**

Please allow up to 30 days for a response, unless you requested a priority response (in 5 business days) at an additional surcharge of \$500. An invoice will be provided with your response.

We will review the project based on the information you included in the Project Info submittal form, which is included in this report. Also any additional information including photographs, survey documents, etc. attached during the project submittal process and/or sent via email referencing the project title (from the first page of this report).

Thank you for submitting your project for review to the Virginia Natural Heritage Program through the NH Data Explorer. Should you have any questions or concerns about DCR, the Data Explorer, or this report, please contact the Natural Heritage Project Review Unit at 804-371-2708.

## **Wyatt, Frederick (DEQ)**

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**From:** Frazier, Teresa (DEQ)  
**Sent:** Friday, May 22, 2015 7:40 AM  
**To:** Wyatt, Frederick (DEQ)  
**Subject:** FW: Beaver Creek request

Fred,  
There is no T&E map because none are present.

Teresa

---

**From:** Frazier, Teresa (DEQ)  
**Sent:** Thursday, May 21, 2015 3:31 PM  
**To:** Wyatt, Frederick (DEQ)  
**Subject:** Beaver Creek request

Fred,  
Outfall 001 river mile is 6CBEV023.81, in Section 4, Class V, stockable trout waters.  
TMDL segment is VAS-O07R\_BEV02A94, factsheets attached.

I couldn't get DGIF map page to print. I will try first thing tomorrow.

Teresa Frazier

DEQ Southwest Regional Office | 276.676.4805 | [Teresa.Frazier@deq.virginia.gov](mailto:Teresa.Frazier@deq.virginia.gov)  
355-A Deadmore Street, Abingdon, VA 24210

<http://www.deq.virginia.gov>

## VaFWIS Initial Project Assessment Report

Compiled on 5/21/2015, 2:56:32  
PM[Help](#)Known or likely to occur within a 2 mile radius around point 36.6569000 -82.1041597  
in 191 Washington County, 520 Bristol City, VA[View Map of Site Location](#)561 Known or Likely Species ordered by Status Concern for Conservation  
(displaying first 54) (54 species with Status\* or Tier I\*\* or Tier II\*\*)

| <u>BOVA Code</u> | <u>Status*</u> | <u>Tier**</u> | <u>Common Name</u>         | <u>Scientific Name</u>              | <u>Confirmed</u> | <u>Database(s)</u> |
|------------------|----------------|---------------|----------------------------|-------------------------------------|------------------|--------------------|
| 010333           | FESE           | I             | Darter, duskytail          | Etheostoma percnurum                |                  | BOVA               |
| 060094           | FESE           | I             | Pearlymussel, littlewing   | Pegias fabula                       |                  | BOVA               |
| 060052           | FESE           | I             | Pigtoe, shiny              | Fusconaia cor                       |                  | BOVA               |
| 060122           | FESE           | I             | Rabbitsfoot, rough         | Quadrula cylindrica strigillata     |                  | BOVA               |
| 060036           | FESE           | I             | Riffleshell, tan           | Epioblasma florentina walkeri       |                  | BOVA               |
| 050021           | FESE           | II            | Bat, gray                  | Myotis grisescens                   |                  | BOVA               |
| 050035           | FESE           | II            | Bat, Virginia big-eared    | Corynorhinus townsendii virginianus |                  | BOVA               |
| 060146           | FESE           | II            | Bean, Rayed                | Villosa fabalis                     |                  | BOVA               |
| 060121           | FESE           | II            | Kidneyshell, fluted        | Ptychobranchus subtentum            |                  | BOVA               |
| 060083           | FESE           | II            | Pearlymussel, slabside     | Lexingtonia dolabelloides           |                  | BOVA               |
| 010330           | FTST           | I             | Chub, spotfin              | Erimonax monachus                   |                  | BOVA               |
| 010331           | FTST           | I             | Madtom, yellowfin          | Noturus flavipinnis                 |                  | BOVA               |
| 010430           | SE             | I             | Dace, Tennessee            | Chrosomus tennesseensis             |                  | BOVA, Habitat      |
| 010344           | SE             | I             | Darter, sharthead          | Etheostoma acuticeps                |                  | BOVA               |
| 040267           | SE             | I             | Wren, Bewick's             | Thryomanes bewickii                 |                  | BOVA               |
| 060080           | SE             | II            | Heelsplitter, Tennessee    | Lasmigona holstonia                 |                  | BOVA               |
| 060007           | SE             | II            | Mussel, slippershell       | Alasmidonta viridis                 |                  | BOVA               |
| 040096           | ST             | I             | Falcon, peregrine          | Falco peregrinus                    |                  | BOVA               |
| 040293           | ST             | I             | Shrike, loggerhead         | Lanius ludovicianus                 |                  | BOVA               |
| 040385           | ST             | I             | Sparrow, Bachman's         | Aimophila aestivalis                |                  | BOVA               |
| 010352           | ST             | II            | Darter, greenfin           | Etheostoma chlorobranchium          |                  | BOVA               |
| 010342           | ST             | II            | Darter, sickle             | Percina williamsi                   |                  | BOVA               |
| 010076           | ST             | III           | Shiner, emerald            | Notropis atherinoides               |                  | BOVA               |
| 060069           | FSST           | III           | Riversnail, spiny          | Io fluvialis                        |                  | BOVA               |
| 060086           | ST             | III           | Sandshell, black           | Ligumia recta                       |                  | BOVA               |
| 040292           | ST             |               | Shrike, migrant loggerhead | Lanius ludovicianus migrans         |                  | BOVA               |
| 050022           | FP             |               | Bat, northern long-eared   | Myotis septentrionalis              |                  | BOVA               |
| 010038           | FC             | IV            | Alewife                    | Alosa pseudoharengus                |                  | BOVA               |
| 010343           | FS             | I             | Darter, ashy               | Etheostoma cinereum                 |                  | BOVA               |

|        |    |     |                               |  |  |               |
|--------|----|-----|-------------------------------|--|--|---------------|
| 100248 | FS | I   | Fritillary, regal             | Speyeria idalia idalia                     |  | BOVA          |
| 010341 | FS | II  | Logperch, blotchside          | Percina burtoni                            |  | BOVA          |
| 040093 | FS | II  | Eagle, bald                   | Haliaeetus leucocephalus                   |  | BOVA          |
| 060050 | FS | II  | Pigtoe, Tennessee             | Fusconaia barnesiana                       |  | BOVA, Habitat |
| 080101 | FS | II  | Clubtail, Cherokee            | Gomphus consanguis                         |  | BOVA          |
| 010434 | FS | III | Sculpin, Holston              | Cottus sp. 5                               |  | BOVA          |
| 070010 | FS | III | Amphipod, James Cave          | Stygobromus abditus                        |  | BOVA          |
| 100001 | FS | IV  | fritillary, Diana             | Speyeria diana                             |  | BOVA          |
| 020020 | CC | II  | Hellbender, eastern           | Cryptobranchus alleganiensis alleganiensis |  | BOVA          |
| 030012 | CC | IV  | Rattlesnake, timber           | Crotalus horridus                          |  | BOVA          |
| 040372 |    | I   | Crossbill, red                | Loxia curvirostra                          |  | BOVA          |
| 040225 |    | I   | Sapsucker, yellow-bellied     | Sphyrapicus varius                         |  | BOVA          |
| 040319 |    | I   | Warbler, black-throated green | Dendroica virens                           |  | BOVA          |
| 040306 |    | I   | Warbler, golden-winged        | Vermivora chrysoptera                      |  | BOVA          |
| 060209 |    | I   | Hornsnail, bottle             | Pleurocera gradata                         |  | BOVA          |
| 010075 |    | II  | Shiner, popeye                | Notropis ariommus                          |  | BOVA          |
| 020011 |    | II  | Frog, mountain chorus         | Pseudacris brachyphona                     |  | BOVA, Habitat |
| 020030 |    | II  | Salamander, green             | Aneides aeneus                             |  | BOVA          |
| 020081 |    | II  | Salamander, southern zigzag   | Plethodon ventralis                        |  | BOVA, Habitat |
| 020078 |    | II  | Salamander, Weller's          | Plethodon welleri                          |  | BOVA          |
| 040052 |    | II  | Duck, American black          | Anas rubripes                              |  | BOVA          |
| 040213 |    | II  | Owl, northern saw-whet        | Aegolius acadicus                          |  | BOVA          |
| 040320 |    | II  | Warbler, cerulean             | Dendroica cerulea                          |  | BOVA          |
| 040304 |    | II  | Warbler, Swainson's           | Limnothlypis swainsonii                    |  | BOVA          |
| 040266 |    | II  | Wren, winter                  | Troglodytes troglodytes                    |  | BOVA          |

To view All 561 species [View 561](#)

\*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; FS=Federal Species of Concern; CC=Collection Concern

\*\* I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need

Bat Colonies or Hibernacula: Not Known

#### Anadromous Fish Use Streams

N/A

**Colonial Water Bird Survey**  
N/A**Threatened and Endangered Waters**

N/A

**Managed Trout Streams** ( 2 records ) (Click on Stream Name to view complete reach history)[View Map of All Trout Stream Surveys](#)

| Reach ID | Stream Name   | Class     | Brook Trout | Brown Trout | Rainbow Trout | <a href="#">View Map</a> |
|----------|---------------|-----------|-------------|-------------|---------------|--------------------------|
| 03BVR-01 | Beaver Creek  | Stockable |             |             |               | Yes                      |
| 03SNK-01 | Sinking Creek | Stockable |             |             |               | Yes                      |

**Bald Eagle Concentration Areas and Roosts**

N/A

**Bald Eagle Nests**

N/A

**Habitat Predicted for Aquatic WAP Tier I & II Species** ( 8 Reaches )[View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species](#)

| Stream Name                | Highest TE <sup>*</sup> | Tier Species   |    |    |                      |                            | <a href="#">View Map</a> |
|----------------------------|-------------------------|--|----|----|----------------------|----------------------------|--------------------------|
|                            |                         | BOVA Code, Status <sup>*</sup> , Tier <sup>**</sup> , Common & Scientific Name |    |    |                      |                            |                          |
| Beaver Creek<br>(06010102) | FS                      | 060050   | FS | II | Pigtoe,<br>Tennessee | Fusconia<br>barnesiana     | <a href="#">Yes</a>      |
| Beaver Creek<br>(06010102) | FSSE                    | 010430   | SE | I  | Dace,<br>Tennessee   | Chrosomus<br>tennesseensis | <a href="#">Yes</a>      |
|                            |                         | 060050   | FS | II | Pigtoe,<br>Tennessee | Fusconia barnesiana        | <a href="#">Yes</a>      |
| Clear Creek<br>(06010102)  | FSSE                    | 010430   | SE | I  | Dace,<br>Tennessee   | Chrosomus<br>tennesseensis | <a href="#">Yes</a>      |
|                            |                         | 060050   | FS | II | Pigtoe,<br>Tennessee | Fusconia barnesiana        | <a href="#">Yes</a>      |
| (06010102)                 | SE                      | 010430   | SE | I  | Dace,<br>Tennessee   | Chrosomus<br>tennesseensis | <a href="#">Yes</a>      |
| Beaver Creek<br>(06010102) | SE                      | 010430   | SE | I  | Dace,<br>Tennessee   | Chrosomus<br>tennesseensis | <a href="#">Yes</a>      |

|                             |    |        |    |   |                           |                            |            |
|-----------------------------|----|--------|----|---|---------------------------|----------------------------|------------|
| Clear Creek<br>(06010102)   | SE | 010430 | SE | I | <u>Dace,</u><br>Tennessee | Chrosomus<br>tennesseensis | <u>Yes</u> |
| Goose Creek<br>(06010102)   | SE | 010430 | SE | I | <u>Dace,</u><br>Tennessee | Chrosomus<br>tennesseensis | <u>Yes</u> |
| Sinking Creek<br>(06010102) | SE | 010430 | SE | I | <u>Dace,</u><br>Tennessee | Chrosomus<br>tennesseensis | <u>Yes</u> |

**Habitat Predicted for Terrestrial WAP Tier I & II Species ( 2 Species )**

[View Map of Combined Terrestrial Habitat Predicted for 2 WAP Tier I & II Species Listed Below](#)  
ordered by Status Concern for Conservation

| BOVA Code | Status* | Tier** | Common Name                 | Scientific Name        | <a href="#">View Map</a> |
|-----------|---------|--------|-----------------------------|------------------------|--------------------------|
| 020011    |         | II     | Frog, mountain chorus       | Pseudacris brachyphona | <u>Yes</u>               |
| 020081    |         | II     | Salamander, southern zigzag | Plethodon ventralis    | <u>Yes</u>               |

**Public Holdings:**

N/A

Compiled on 5/21/2015, 2:57:04 PM 1660197.0 report=IPA searchType=R dist= 3218 poi= 36.6569000 -82.1041597  
PixelSize=64; Anadromous=0.30178; BECAR=0.23307; Bats=0.199762; Buffer=0.100298; County=2.432881; Impediments=0.16069; Init=2.485995; PublicLands=1.093909; SppObs=5.535067; TEWaters=1.775922;  
TierReaches=2.242932; TierTerrestrial=9.811915; Total=67.104; Trout=0.590474

**ATTACHMENT 8**

**PCBs Monitoring**

## **Wyatt, Frederick (DEQ)**

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**From:** Richards, Mark (DEQ)  
**Sent:** Friday, September 18, 2015 9:56 AM  
**To:** Wyatt, Frederick (DEQ); Lott, Craig (DEQ)  
**Subject:** RE: PCB Monitoring for Proposed Western Washington County Water Reclamation Facility, VA0092860

Hi Fred,

This looks good to me. When they do submit the protocol for approval using method 1668, it is very important that they adhere to DEQ's TMDL guidance document No. 09-2001 and use a laboratory included on our website.

Thanks!  
Mark

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**From:** Wyatt, Frederick (DEQ)  
**Sent:** Thursday, September 17, 2015 9:28 AM  
**To:** Lott, Craig (DEQ); Richards, Mark (DEQ)  
**Subject:** PCB Monitoring for Proposed Western Washington County Water Reclamation Facility, VA0092860

Based on our conference call yesterday regarding the Beaver Creek TMDL, I have added a special condition to the draft permit requiring PCB monitoring. Attached is the proposed draft permit. Please review and comment on the special condition, PART I E. 13., Page 13 of 13, requiring PCBs monitoring. Thanks!

Fred M. Wyatt  
Virginia Department of Environmental Quality  
Southwest Regional Office  
355-A Deadmore Street  
Abingdon, VA 24210  
Phone: (276) 676-4810  
E-mail: [frederick.wyatt@deq.virginia.gov](mailto:frederick.wyatt@deq.virginia.gov)